Vol. X.—No. 45.] [JULY, 1892.

THE

MINERALOGICAL MAGAZINE

AND

JOURNAL

OF THE

Mineralogical Society.

INSTITUTED 3rd FEBRUARY, 1876.

EDITED BY H. A. MIERS, M.A.,

Reprinted 1965 for
Wm. DAWSON & SONS LTD., LONDON
with the permission of
THE MINERALOGICAL SOCIETY

Mineralogical Society.

OFFICERS AND COUNCIL FOR 1891-92.

PRESIDENT.

PROFESSOR STORY-MASKELYNE, M.P., F.R.S.

PAST-PRESIDENTS.

H. C. SORBY, LL.D., F.R.S. 1876–1879.
PROF. M. F. HEDDLE, M.D., F.R.S.E. 1879–1881.
W. H. HUDLESTON, M.A., F.R.S. 1881–1883.
REV. PROF T. G. BONNEY, D.Sc., F.R.S. 1883–1885.
L. FLETCHER, M.A., F.R.S., 1885-1888.
R. H. SCOTT, M.A., F.R.S., 1888-1891.

VICE-PRESIDENTS.

THE REV. PROFESSOR HAUGHTON, M.D., F.R.S.
HUGO MÜLLER, Ph.D., F.R.S.

TREASURER.

F. W. RUDLER, F.G.S.

GENERAL SECRETARY.

L. FLETCHER, M.A., F.R.S., 36 Woodville Road, Ealing.

FOREIGN SECRETARY.

T. DAVIES, F.G.S.

P. DUDGEON, F.R.S.E.
PROF. A. H. GREEN, M.A., F.R.S.
A. HARKER, M.A., F.G.S.
PROF. W. J. LEWIS, M.A., F.C.S.
PROF. GRENVILLE COLE, F.G.S.
T. W. DANBY, M.A., F.G.S.
JOHN HORNE, F.R.S.E., F.G.S.
FRANK RUTLEY, F.G.S.
REV. H. P. GURNEY, M.A., F.G.S.
PROF. G. D. LIVEING, M.A., F.R.S.
MAJ.-GEN. C. A. McMAHON, F.G.S.
J. J. H. TEALL, M.A., F.R.S.

TRUSTEES.

PATRICK DUDGEON, F.R.S.E.
PROF. N. S. MASKELYNE, M.P., F.R.S.

AUDITORS.

B. KITTO, F.G.S.
F. RUTLEY, F.G.S.

LIBRARIAN.

PROFESSOR W. J. LEWIS, M.A., F.C.S., The New Museums, Cambridge
(to whom all publications intended for the Library of the Society should be forwarded)

EXCERPT MINUTES OF COUNCIL MEETING.

l in the Apartments of the Geological Society, November 10th, 1891.

R. H. Scott, Esq., M.A., F.R.S., President, in the Chair.

he death of Mr. J. E. Drew, Ordinary Member of the Society, was ›unced.

ir. W. J. Pope was elected an Ordinary Member.

he thanks of the Council were voted to Mr. Fletcher for his offer to ay the cost (£13 6s. 0d.) of the illustration of his paper on the Optical catrix.

esolved that the Editing Committee of the Journal consist of Prof. y-Maskelyne, Mr. Hudleston, Mr. Miers, Dr. Hugo Müller, and Mr. ›her.

he following dates of Meeting for the year 1892 were approved:— ıary 26th, April 12th, June 14th, October 25th (Anniversary).

he draft annual report was amended and approved.

ANNIVERSARY MEETING.

l in the Apartments of the Geological Society, November 10th, 1891.

R. H. Scott, Esq., M.A., F.R.S., President, in the Chair.

irteen Members and one visitor were present.

he following Report of Council for the Session 1891-2 was read and oved : –

REPORT.

he Balance Sheet for the year ending December 31st, 1890, ch was issued with Number 43 of the Journal, showed that state of finances was not unsatisfactory : the Assets clusive of the Stock of the Journal and the Library) amounting £220 0s. 2d. in excess of the Liabilities. In this connection ıay be mentioned that the number of Members who had pounded before December 31st, 1890, for their Annual scription was 31.

During the session 1890-91 four ordinary Members have be elected : on the other hand, the Society has to regret the rece death of one of its original Members, Mr. F. Drew, and also Mr. R. J. Jenkinson : further, the names of two Members a one Associate who are without known address have been remov from the List. The Society now consists of 108 ordina Members, 21 corresponding Members, and four Associates.

Four meetings have been held, all in London, and (by ki permission) in the Apartments of the Geological Society, B lington House.

Only one number of the Journal has been issued since the l Annual Meeting: it comprised descriptions of Cornish Cassiteri by Mr. Solly, and of a regular growth of Marcasite and Ir pyrites by Mr. Trechmann ; also two papers by Mr. Miers, one them describing various forms of goniometer, the other annou ing the tetartohedrism of Ullmannite: two papers on occurrence of Riebeckite by Mr. Teall and Professor Grenv Cole, respectively ; a description of a rapid method of chemi examination of various minerals by Dr. Burghardt ; and a b account, by Mr. Gorham, of an extremely ingenious metho constructing crystal-models by the plaiting of their zones ; a a useful series of abstracts of the more important mineralog papers published in other journals. For the illustration of of the papers, the Society is indebted to the generosity of authors, Mr. Solly and Mr. Miers respectively.

The next number of the Journal will shortly be in the ha of the Members : reference to its contents will be made subsequent Report.

The following were elected Officers and Council for the year 1892-3 :—

President. Prof. M. H. N. Story-Maskelyne, M.P., F.R.S.

Vice-Presidents. Rev. Prof. S. Haughton, M.D., F.R.S.
Hugo Müller, Ph.D., F.R.S.

Treasurer. F. W. Rudler, F.G.S.

General Secretary. L. Fletcher, M.A., F.R.S.
Foreign Secretary. T. Davies, F.G.S.

Ordinary Members of Council.
P. Dudgeon, F.R.S.E.
Prof. A. H. Green, M.A., F.R.S.
A. Harker, M.A., F.G.S.
Prof. W. J. Lewis, M.A., F.C.S.
Prof. Grenville Cole, F.G.S.
T. W. Danby, M.A., F.G.S.
John Horne, F.R.S.E., F.G.S.
Frank Rutley, F.G.S.
Rev. H. P. Gurney, M.A., F.G.S.
Prof. G. D. Liveing, M.A., F.R.S.
Maj.-Gen. C. A. McMahon, F.G.S.
J. J. H. Teall, M.A., F.R.S.

Mr. Scott then vacated the Chair, which was was taken by Prof. Story-Maskelyne, who proposed a vote of thanks to the retiring President: this was carried with acclamation.

Votes of thanks were then passed to the retiring Treasurer (Professor Gurney), to the retiring Members of Council (Dr. Burghardt, Mr. Miers, Mr. Solly and Prof. J. M. Thomson), to the Auditors (Mr. Rudler and Mr. Kitto), and to the Geological Society for the use of its Apartments.

The following papers were read :—

1. Notes on some minerals from the Apatite-mines of Risör: by Mr. Rudler. (Page 1.)
2. Analysis of Shetland Aragonite : by Mr. J. S. Thomson. (Page 22.)
3. On Pinite from Breage, Cornwall: by Mr. J. H. Collins. (Page 8.)
4. Notes on Minerals from Torreon, Chihuahua: by Mr. H. F. Collins. (Page 15.)
5. Description of a specimen of Cornish Danalite: by Mr. Miers and Mr. Prior. (Page 10.)

GENERAL MEETING.

Held in the Apartments of the Geological Society, January 26th, 189

Dr. Hugo Müller, F.R.S., Vice-President, in the Chair.

Twelve Members were present.

The following papers were read :—

1. On Pectolite and Okenite from new localities, the former with ne appearances : by Prof. Heddle.

2. Notes on Orpiment, Rittingerite, and a Stage-Goniometer : by M Miers. (Page 24.)

A letter was read from Mr. W. S. Gresley, F.G.S., concerning Fibro Hæmatite from Lake Superior.

EXCERPT MINUTES OF COUNCIL MEETING.

Held in the Apartments of the Geological Society, April 12th, 1892.

Prof. Story-Maskelyne, M.P., F.R.S., President, in the Chair.

The audited Balance Sheet for the year 1891 was submitted and approve and ordered to be issued with the next Number of the Journal (page vi.

Mr. H. F. Collins and Mr. J. W. Gregory were elected Ordina Members of the Society.

The resignation of Mr. W. Boxhall, Ordinary Member, was accepte

The thanks of the Council were voted to Major-Gen. C. A. McMah for his offer to defray the cost of illustrating his paper on the micr chemical analysis of rock-making minerals.

GENERAL MEETING.

Held in the Apartments of the Geological Society, April 12th, 1892.

Twelve Members and one visitor were present.

The following papers were read:

1. On some examples of cone-in-cone structure: by Prof. Grenville ole.

2. On the production of a lamellar structure in Quartz by mechanical eans: by Prof. Judd.

3. Notes on the micro-chemical analysis of rock-making minerals: Major-Gen. C. A. McMahon.

4. Note on a sheaf-like aggregation of crystals: by Mr. Kitto.

5. Note on twins of Staurolite: by Mr. Rutley.

Mineralogical Society—Abstract of Receipts and Payments from 1st January to 31st December 1891.

RECEIPTS.

	£	s.	d.
Balance from year 1890	5	8	4
Subscriptions:—(1) in advance	3	3	0
,, (2) current	64	10	6
,, (3) in arrear	6	6	0
Entrance Fees and Compositions	14	14	0
Sale of Journal	20	15	3
Dividends on Stock	7	2	0
	£121	19	1

PAYMENTS.

	£	s.	d.
Printing and Stationery	83	6	0
Illustrations	5	11	0
Attendance at Meetings	1	13	0
Editorial and Clerical Expenses (1891)		Nil	
Postages, Parcels, &c.	10	17	6
Insurance of Stock of Journal (1891)	1	5	0
Investments and Commission	7	2	0
Binding and Cloth Cases for Journal	3	8	0
Balance	8	16	7
	£121	19	1

Examined and compared with the vouchers and found correct. (Signed)

BENEDICT KITTO,
FRANK RUTLEY, } *Auditors.*

LIABILITIES.

	£	s.	d.
Printing and Stationery	81	2	6
Illustrations	4	12	0
Attendance at Meetings	0	5	0
Received in advance (1) Subscriptions	6	6	0
,, ,, (2) Sale of Journal	0	10	6
Excess of Assets over Liabilities	201	2	9
	£293	18	9

The number of Life Members on December 31st, 1891 was 31.

ASSETS.

	£	s.	d.
Balance as above	8	16	7
Subscriptions for 1889-91 unpaid	11	11	0
Stock in 2¾ per Cent. £264 12s. 9d. at 95¾	252	8	8
Interest on Stock (unpaid)	1	16	3
Sale of Journal:—(1) due from Publishers	9	6	6
,, ,, (2) due on Office Account	5	10	3
Due for extra Authors' Copies	4	9	6
	£293	18	9

The Stock of Publications and the Library are not included in the above assets.

(Signed)

L. FLETCHER,

General Secretary.

THE MINERALOGICAL MAGAZINE

AND

JOURNAL

OF THE

MINERALOGICAL SOCIETY.

No. 45. JULY, 1892. Vol. X.

erals from the Apatite-bearing Veins at Noerestad near Risör on the S.E. Coast of Norway.

By R. H. Solly, M.A., F.G.S.

(*With a note on their occurrence by* A. L. Collins.)

[Read November 10th, 1891.]

HE minerals described in this paper were obtained by Mr. Arthur L. Collins last summer, and their mode of occurrence is explained in accompanying note by him. My description will deal in detail with r crystallographic characters.

Apatite.

orms present; $a\{10\bar{1}\}$ $x\{210\}$ $o\{111\}$.

hese crystals are more or less altered and often cavernous, of a light ish-brown colour, partially coated by brown oxide of iron. Owing to alteration the lustre, except on the prism faces, is very dull.

he crystals are grown together nearly parallel to the prism faces.

Many of the crystals were unsymmetrically developed, simulating ob- e symmetry owing to the unequal development of the x and a faces, they are nearly always curved.

They vary in size from 1 to 5 cm.

Some of the crystals have bright little crystals of sphene of a bro colour embedded in their basal planes.

Rutile.

Forms present; $a\{100\}$ $s\{111\}$ $e\{011\}$ $m\{110\}$.

These are of a dull steel colour on the outside, are slightly iron-stain and have a reddish brown colour on the broken surface.

They cleave very easily parallel to the a plane.

The a faces are large and deeply striated parallel to m; m very na row; e well developed and striated parallel to s, which is always small.

The crystals are usually simple; when twinned the twin plane and co position face is (011).

Zircon.

Forms present; $p\{111\}$ $x\{311\}$ $v\{221\}$ $m\{110\}$ $a\{100\}$.

These crystals resemble in colour and development the crystals of z con found in the zircon-syenite of South-west Norway.

The colour is dark reddish brown; lustre vitreous; m large, p sma x v and a very narrow.

They are sometimes curiously curved.

Scapolite.

Forms present; $a\{100\}$ $m\{110\}$ $f\{311\}$ $r\{111\}$.

There are two distinct habits; to one belong large iron-stained cryst from 1 cm. to 30 cm. in length resembling the nuttalite from Arendal Norway. Those of the other habit resemble the meionite from Mo Somma. These crystals are small, of a dirty white colour, often mu altered at the surface, and slightly stained with iron oxide; they exhibi very perfect cleavage parallel to the a faces; a large and very narrow; and f well developed; r is usually unsymmetrically developed as in t crystals from Monte Somma.

Amphibole and Pyroxene.

This specimen is a very interesting one.

It consists of a number of well developed dark green oblique pris terminated by the basal plane, from 0·5 cm. to 2 cm. in length, and less th 0·5 cm. in breadth.

These large green prisms are remarkable, as they have the form a angles of pyroxene, exhibiting $m\{110\}$ large, $b\{010\}$, $a\{100\}$ narr with a rough $c\{001\}$ face.

On examining the crystals with a lens, the prisms are found to be m

less cavernous, being built up of a number of small crystals disposed rly parallel to the intersection of the prism planes. They are almost ariably twinned about *a*, and have *m* large, *a* and *b* narrow. The measure-nt of a cleavage flake gave 55°30′ (55°49′ Descloizeaux). A thin cleavage ce was examined between crossed nicols in a polarising microscope, d the direction of extinction was found to make with the edge *m m*, angle of 14°. This direction is that of maximum velocity in the te, so there can be no doubt that these small crystals are amphibole. ny writers on petrology have described the alteration of pyroxene into phibole by metamorphism; but the uralitic aggregations of amphibole he dolerites always contain magnetite and titaniferous iron and other eration products and are embedded in the rock. The specimen to eh Rose (*Pogg. Ann.* xxii. 322, 1831) gave the name uralite was from stovaja, Lake Baltym, near Katharinenburg in the Urals, and others e described resemble these crystals in being implanted, but they are ch more altered.

This specimen differs, I believe, from those last described in being in-ately associated with and apparently crystallised with black horn-de crystals which are often well developed, having the faces *a* {100} 0} *m*{110} *x*{1$\bar{1}\bar{1}$} ; a cleavage plate gave a smaller extinction angle the uralite, but otherwise the features are the same.

Sphene.

Forms present; *c*{001} *g*{101} *r*{011} *n*{123} *η*{145} *v*{$\bar{1}$01} *t*{$\bar{1}$21} *f*{$\bar{2}$33}; last three forms are doubtful as the planes are rounded and dull.

The crystals are of a dark to light brown colour with vitreous to greasy re.

Some of the crystals attain a length of 12 cm. and a breadth of 5 cm.

The specific gravity of a fine large crystal was found to be 3·6.

The crystals are always twinned; twin plane and composition face 01).

All the large crystals consist of aggregations of twinned crystals grown allel to the *c* face but inclined more or less to the edge *b c*, so that in apparently simple crystal the edge *c r* is not parallel to the edge *r r* as ld be the case in a simple crystal. This want of parallelism is well wn in some of the crystals where the angle between the zone axes 0] and [410] is 38° instead of 30°20′$\frac{1}{3}$, and the angle between *r* (011) *η* (145) differs as much as 5° from the calculated value.

The crystals all possess a highly perfect and sometimes largely de-ped "face of union" (Absonderungsfläche) due to repeated twinning

parallel to this face, and similar to that observed on sahlite, corundum calcite and other minerals.

G. H. Williams (*Amer. Journ. Sci.* (1885) 29, 486) has described a "face of union" or "parting" on the sphenes from Pitcairn St. Lawrence Co., New York. The face by which it is shown he describes as a small but very bright plane $\eta\{145\}$ lying in the zone [011,101], and according to his drawing, holohedrally developed.

The angles I measured on the smaller crystals between the "face union" and the other faces agree well with the calculated angles required for (145); but on the larger crystals, those described above, the angles agree much better for the form (134); in this case, however, the crystal not being a simple one, this "face of union," unlike the one described by Williams, is always hemimorphically developed.

In many of the crystals the η plane is ill developed, but the twin lamellæ appear in a striking manner on one-half of two of the r faces, giving to those parts a curious lustre, like that of bronzite or avanturine, and marking the twin junction of the two crystals and the hemimorphic development of the η face.

These crystals are modified by rounded planes of y v t and l.

On another crystal of a lighter colour the n plane is well developed with r and c, and has η large and hemimorphically developed.

Among the specimens of sphene were some small very brilliant simple crystals, having n large, r c and y small. They exhibit only in a slight degree the η twinning.

Appendix.

Note on the Mode of Occurrence of the above Minerals.

By A. L. Collins.

THE specimens described by Mr. Solly were found last summer during the course of mining operations upon some small apatite-bearing veins at Noerestad, near Risör, on the south-east coast of Norway. The whole district, from Langesund on the east to near Arendal on the west, has been extensively worked for apatite and rutile for many years past, but this particular locality has never been described, or, so far as the writer is aware, even examined before.

The country rock is gneiss, often highly garnetiferous, with hornblende schist, mica-schist, and occasionally quartzite; and it is pierced by large

ses of a dioritic rock, consisting mainly of hypersthene and labradorite, gabbro of Norwegian geologists. The schistose rocks are also pierced laces by dykes and irregular masses of a coarse-grained granite. The usive masses of gabbro generally stand out conspicuously as hills some dreds of feet in height; and owing to the very extensive glaciation ch this part of Norway has undergone, considerable areas of bare are almost everywhere available for examination.

he veins, which are generally small and irregular, occur in all these s, but most commonly in or near to the gabbro, which is altered in r neighbourhood to a characteristic white and black spotted rock, the olite-hornblende rock of Messrs. Brögger and Reusch.[1]

his altered gabbro often gives distinct indications of the presence of sphoric acid by blowpipe tests.

he veins in the Noerestad district have the same general direction as enclosing rocks; but in places they clearly cut across them, and even en- e angular fragments of the wall rock. The vein-filling is mostly horn- de, scapolite, apatite and calcite; but the following minerals, arranged ghly in order of frequency, were also observed:—

Albite (massive).
Titanic iron ,,
Rutile (crystals and massive)
Orthoclase (crystals and massive).
Augite.
Sphene (crystals and massive).
Magnetic pyrites.
Iron pyrites (crystals).
Hydrated oxide of iron (decomposition product).
Chalcopyrite.
Epidote.
Chlorite.
Mica (? Phlogopite).
Quartz.
Molybdenite.
Zircon (small brilliant crystal).

he veins often show a distinct combed structure—especially those ing through the schistose rocks: the opposite sides being a greenish-

[1] W. C. Brögger and H. H. Reusch, *Norske apatitforekomster*, p. 268. *Nyt asin for Naturvidenskaberne.* Christiania, 1880.

black lustrous cleavable hornblende, passing gradually into the count rock on the outside, but finely crystallised towards the centre: t consists in some cases of massive opaque grey apatite, and in others coarsely crystalline sparry calcite, including crystals and masses of li green translucent apatite, and very perfect crystals of hornblende, scapoli sphene and other minerals. This calcite is often dissolved away by action of surface water, leaving irregular cavities, in places over 2 f wide and many square yards in area; these are lined on each side w fine crystals of hornblende and scapolite, and contain all the forme enclosed crystals in the earth and mud surrounding the large roun blocks of calcite still left at the bottom. Some of these crystals were considerable size: several crystals of sphene were found over 6 inc long; while one crystal of scapolite measured considerably over a foot length, and 5 inches in diameter. The prism faces of the larger apa crystals were commonly much curved: and the pyramid faces of scapolite and rutile crystals were often very unequally developed, so as give almost the appearance of oblique symmetry. Many specimens w curiously corroded and rounded at the edges; and most of the lar crystals of sphene and scapolite were broken or cracked partly throu and re-cemented with calcite or oxide of iron: these altered crystals be often found imbedded in apparently unaltered sparry calcite.

It will be seen that all the evidence—the common combed struct and bi-lateral symmetry of the vein filling—the frequency of drusy cavi lined with crystals—and of crystals included in massive calcite or apa —goes to show that these deposits are segregation veins of ordin type, whose fillings have been introduced solely by aqueous solutio indeed, the extensive alteration of the enclosing rocks, and the corros of the crystals in the veins themselves, clearly point to former extens hydro-thermal action. They seem to bear the closest analogy to some the apatite deposits of Canada, and especially to certain veins in Renf Co., Ontario, described in the Report of the Royal Commission on Mineral Resources of Ontario.[1]

Messrs. Brögger and Reusch, who made a detailed examination of the then known apatite deposits of Norway in 1874, came to the c clusion that they were of eruptive origin; apparently including in term, however, the action of deep-seated solutions, as well as of gase substances and of molten masses.[2] It is true that their attention se

[1] *Rep. Roy. Commission Min. Resources of Ontario*, p. 439. Toronto, 1890.
[2] W. C. Brögger and H. H. Reusch, *loc. cit.* p. 295.

ve been mainly directed to the deposits situated entirely in the gab-
which in Norway are commercially the more important, and in which
well-developed crystals, and drusy cavities, are of much rarer oc-
nce: but neither of the two latter theories seems to apply even
is class of vein, as seen at this locality.

to the relative ages of the various minerals in the veins, an
ination of some hundreds of specimens shows that hornblende and
olite—the component minerals of the altered gabbro as frequently
d in the neigbourhood of the veins—are the oldest vein-filling minerals:
d, many of the smaller veins, and especially the lenticular masses
non in the gabbro—consist of nothing else. These were
eeded by titanic iron and rutile, the two minerals being often
d in large masses close together, and even gradually passing into
nother: and these again by apatite. Sphene is clearly more recent
either apatite or rutile: while calcite would seem to be the most
t of all. The rarity of quartz in most of the veins was especially
eable in a country like Norway, where it is usually so common: but
or two remarkable exceptions were observed—notably at Vaereland,
miles south-west of Noerestad; where a vein was found consisting
st entirely of cellular sugary and ferruginous quartz, and rutile in
ant red-brown crystals, varying in size from mere specks to stout
ns over an inch in length.

On the Pinite of Breage in Cornwall.

By J. H. Collins, F.G.S.

[Read November 10th, 1891.]

IT has long been known that several of the felspar-porphyry dy (Elvans) of the West of Cornwall contain crystals of pinite—ap rently pseudomorphous after iolite—as an accessory mineral, and sim crystals occur in the granite in several places.[1]

In the parish of Breage there are several of these dykes running wards the sea in a south-easterly direction, which are somewhat larg used as road-material. That which reaches the sea at Praa is in pla thickly charged with the pinite crystals, and the same in a somewhat degree may be said of the dyke which passes from the village of T through Great Wheal Fortune. By a careful examination of the he of stone broken from these dykes for road material good specimens be readily obtained, and sometimes one hand-specimen will contain sev of the crystals.

The general appearance of the rock is that of a moderately fine-grai porphyry, having a basis of white quartz and greenish-gray and sligh kaolinised felspar. In this basis are set occasional "blebs" of sm quartz, macled crystals of pink or white orthoclase, some as much three-quarters of an inch long, and flakes of a dark ferruginous micace mineral, together with the pinite crystals already referred to.

The pinite is very dark greenish or brownish in colour, sometimes deed almost black; the hardness is from 2 to 2·5, and the specific gra about 2·8. The crystals are frequently grouped into bundles, and lateral planes, apparently 12 in number, are rarely very perfect. T is a distinct basal cleavage, and the basal planes are often found co with minute scales of some micaceous mineral. The crystals are dently pseudomorphs by alteration, and there seems reason to bel that the original mineral was iolite, although an analysis of the pi

[1] See the Author's "Handbook to the Mineralogy of Cornwall and Devon," and Mr. A. K. Barnett's "Observations on the Elvans, &c., of Cornwall."

gests a difficulty which is not easily explained away. My analysis of a ber of the crystals of the Breage pinite is as follows (I give Dana's composition of iolite beside it for comparison) :—

		Breage pinite.		Dana's typical iolite.
H_2O	by desiccation 0·20 by ignition 5·00	5·20		
SiO_2	... ...	45·90	...	49·40
Al_2O_3	... ...	38·80	...	33·90
eO & Fe_2O_3	... ...	0·50	...	7·90 (protoxide)
MnO	... ...	trace		
CaO	... ...	0·24		
MgO	... ...	0·16	...	8·80
K_2O	... ...	8·09		
Na_2O	... ...	trace		
Loss & not det.		... 1·11		
		100·00		100·00

ow if this pinite was originally iolite of ordinary composition, it must lost magnesia and protoxide of iron, and acquired water and potash. only difficulty here is the acquisition of so large a proportion of pot- since the ordinary course of change, as in the kaolinisation of felspar, r alkalies to be carried off by the circulating waters. It thus appears, we have to suppose, either that the original mineral contained potash which case it was not iolite as we know it—or else that potash has in some extraordinary way absorbed and condensed in this mineral. this same dilemma exists in all cases where pinite is supposed to be red iolite—for pinite always and iolite never contains alkali in not- proportions.

The difficulty is much lessened if we suppose the pinite to be pseudo- rphous after nepheline, like Allan's gieseckite from Greenland. Nor- nepheline contains large quantities of potash and still larger quanti- of soda. A removal of the soda, leaving the potash intact, and a ll part of the silica from nepheline would give us just such a mineral his pinite. Dana gives for the type composition of nepheline—silica 2; alumina 33·7 ; soda 16·9 ; potash 5·2 = 100. Removing the soda introducing 5 per cent. of water, the proportions would become near ·9 silica, 38 alumina, and 6 potash—or quite sufficiently near to our lysis to allow of the supposition.

Danalite from Cornwall.

By H. A. Miers, M.A., and G. T. Prior, M.A.

[Read November 10th, 1891.]

THE specimen which is the subject of the present note consists of group of large rude, reddish crystals of tetrahedral aspect, whi in colour, lustre, and general appearance, resemble garnet; they we formerly supposed to be garnet pseudomorphous after some tetrahedr mineral, and the original mineral was presumed to have been fahlerz, account of the size of the crystals, which measure as much as 3 to centimetres across.

The specimen was purchased from the late Mr. Richard Talling in 186 two years before the first discovery of danalite in America, and is fro Redruth.

On a fractured surface the mineral is seen to consist of a substance vitreous or resinous lustre, varying in colour from columbine-red (t colour of almandine) to a brick-red (like that of essonite); througho the mass are dispersed granules of quartz, and near the surface, where is slightly altered, it also contains small crystals of mispickel, minu specks of a black mineral, and in some places calcite. These impuriti give it somewhat the appearance of a mineral of secondary origin.

On the other hand the tetrahedra do not display the characteris twinning of fahlerz, nor that of copper pyrites.

If they are not pseudomorphs, the only tetrahedral silicate to whi they could be referred is helvite, but it seemed highly improbable th such gigantic crystals of so rare a mineral could occur in Cornwall, whe it was entirely unknown. The minerals of the Helvite group (helvi and danalite) for many years were only represented by the small yello tetrahedra found at Schwarzenberg in Saxony, but have subsequent been found in many places where they attain considerable dimension At Lupiko in Finland, for instance, tetrahedra of helvite measure inches across (Kokscharow, *Mat. z. Min. Russl.* 5, 320), and the large t gonal tetrahedra of achtaragdite, from R. Achtaragda, in Siberia, a now usually regarded as pseudomorphs after helvite.

closer examination of the Cornish mineral shows that it is in reality seudomorph; for small crevices and cavities in the large crystals in the massive material contain occasionally minute, but very perfect, hedra of a reddish brown or yellow colour, with glistening faces; e are capable of exact measurement, and are found to have the tetra- on angle 109°28′; moreover, they are translucent, and remain dark een crossed Nicols; hence there can be no doubt that the form of nineral is not due to any pseudomorphous replacement, but that it y crystallises in tetrahedra belonging to the cubic system.

ne present specimen, as will be seen from the following description, nbles both in appearance and composition the danalite found in ite at Rockport and Gloucester in Massachusetts (J. P. Cooke, *Amer. n. Sci.*, 42 (1866), 73), and probably also at Bartlett in New Hamp-, in granite (M. E. Wadsworth, *Proc. Boston Soc. Nat. His.*, 20 (1879), , but the mode of occurrence of the Cornish danalite is peculiar and omposition it differs in some respects from the variety previously ysed.

ne large tetrahedra are here associated with imperfectly crystallised ns of quartz of later growth, and with small crystals of mispickel, were apparently contemporaneous with the danalite; the tetrahedra et from a layer of massive danalite from a quarter to half-an-inch , which passes into a matrix consisting of a compact mixture of ite and mispickel, traversed by threads of quartz; associated with nispickel are a very few small crystals of blende.

ne large tetrahedra of danalite, where exposed, have a shining but en surface, but they are partially covered with a layer of platy irre- quartz prisms; upon their surface are also to be noticed occasional ite crystals of copper pyrites.

aterial taken from the interior has the following characters:—Crystal- ; lustre vitreous to resinous, the darker portions in particular are ous; colour columbine-red; translucent; streak light pink; cleavage lel to the faces of the tetrahedron; H = 5½; G = 3.350.

thin section the mineral resembles a dark-coloured isotropic garnet. ne minute crystals found in the small cavities are brilliant tetrahedra smooth plane faces and without modifications, measuring about m across. They are mostly of the same colour as the main mass of naterial, but some are yellowish, and one was found which, while t one end, was a clear greyish-yellow at the other. This association s to indicate the presence in a single crystal of two minerals, the red lite and the yellow helvite, the colour of the latter resembling that

of the helvite from Brüder Lorenz mine at Breitenbrunn. Hence t is surprising to find that this specimen yields on analysis a composition termediate between that of danalite and that of helvite.

Analysis.—The specimen, although of considerable size, was so imp that it was not easy to obtain sufficient material fit for analysis. coarse material was broken into small fragments, which were then sha up with methylene iodide of specific gravity 3·3. From the portion wh sank in this liquid, the most transparent pieces were picked out un the lens. The mineral was decomposed by digestion with concentra hydrochloric acid. The silica obtained on evaporation contained abou per cent. of impurities, which were separated by digestion with sodi carbonate solution. In the calculation of the analysis the weight of t impurity was deducted from the weight of material used. The ir with a portion of the beryllium, was separated by double precipitat with sodium acetate, and the zinc precipitated in the filtrate after ac fying with acetic acid by hydrogen sulphide. The beryllium was se rated from the manganese by repeated precipitation with ammonia, finally the manganese was precipitated by ammonium sulphide, weighed as sulphide after ignition in hydrogen. The sodium acetate cipitate containing the iron and a portion of the beryllium was dissol in hydrochloric acid, and the bases were reprecipitated by ammonia, d and weighed. The separation of the beryllium and iron was then effe by Deville's method, as modified by Cooke (*Am. J. Sci.* 42 (1866), 73); the iron was driven off as ferrous chloride from the beryllia by ignitio a platinum tube, first in a current of hydrogen and then very strongly the blowpipe in a current of hydrochloric acid. The residue of ber was tested for aluminium by Penfield's method (*Am. J. Sci.* 32 (18 107), *i.e.* it was dissolved in hydrochloric acid, evaporated to dryn dissolved in least possible quantity of water, treated with solutio caustic soda until the precipitate first formed just re-dissolved, and fi transferred to a beaker containing about 800 c.c. of water, which was boiling for an hour. A slight precipitate was obtained in the filt but it gave no colour with cobalt nitrate. The analysis gave the follo numbers :—

SiO_2	= 29·48
FeO	= 37·53
MnO	= 11·53
ZnO	= 4·87
BeO	= 14·17
CaO	= trace
S	5·04
	102·62

ecific gravity at 17° = 3·350

ght of material used = 0·6728 gram; for the sulphur 0·1488 gram.

The equivalent ratios are :—

SiO_2	= 49·205
R	= 131 09
S	= 15·77

ich correspond more closely to the formula $RS.7RO.3SiO_2$ than to t usually accepted $RS.6RO.3SiO_2$. The published analyses, however, both helvite and danalite show considerable variations between these results. Thus one of the latest analyses of helvite by Sloan (*Chem.* s, 46, 195) gives S : R : SiO_2 = 1 : 8 : 3·4; and one of the original yses of danalite by Cooke gives S : R : SiO_2 = 1 : 8·4 : 3·3.

Having regard to these discrepancies, a repetition of Gmelin's analy- (which shows a loss of about 4 per cent.) of helvite from Schwarzen- g seemed desirable. The same methods of analysis were employed. e material was separated from impurities of quartz, calcite, etc., by the of methylene iodide, but unfortunately it still retained some of the ociated fluor which has a specific gravity almost the same as that of helvite. Amongst the minerals which sank in the methylene iodide s some scheelite, which is not mentioned as an actual associate of vite.

The analysis gave the following numbers :—

SiO_2	31·85
FeO	4·26
MnO	42·47
BeO	14·25
Al_2O_3	0·74
CaO	3·16
S	4·81
	101·54

or deducting the weight of fluor corresponding to the weight 3·16 p.c. lime

		Atomic proportion.		
SiO_2	= 33·33	55·62	or	3·5
FeO	= 4·45	6·20		
MnO	= 44·43	62·80	131·65	8·3
BeO	= 14·92	62·65		
Al_2O_3	= 0·77			
S	= 5·03	15·74		1
	102·93			

Specific gravity at 18° = 3·202.

Weight of material used 1·1091 gram ; for sulphur 0·3988 gram.

Mineralogical Notes from Torreon, State of Chihuahua, Mexico.

By Henry F. Collins, Assoc.M.Inst.C.E., A.R.S.M.

[Read November 10th, 1891.]

1.—On a new locality for Aurichalcite.

the early part of 1890 I noticed in some of the workings of the Torreon Mines, and chiefly on a decomposed chalcopyrite or in connection therewith, a greenish-blue to sky-blue lamellar coating at $\frac{1}{8}$ inch in thickness, with sometimes isolated plumose groups of crystals having a pearly lustre. Both appearance and mode of occurrence of the mineral led me to think it a basic sulphate of copper, probably cyanotrichite, or possibly a new species. Soon afterwards however, it was noticed that when the ore, as sorted for smelting, contained any quantity of the pale blue incrustation the cyanide assay failed to give accurate results in the estimation of copper, and on testing the ore qualitatively for zinc quite an appreciable quantity was found. Want of leisure prevented a more extended examination, but a good many specimens were selected and carefully preserved.

A few months ago some of the crusts were broken up, and with the help of lens and forceps carefully separated from gangue till some grams of almost absolutely pure crystals were obtained for analysis. A preliminary examination proved the presence of CO_2 and absence of Fe and SO_3. Material weighing 3·089 grams was therefore taken for determination of CO_2 in a Schrodter's apparatus with dilute H_2SO_4, and after solution the insoluble residue weighed ·049 gram, consisting of minute traces of hæmatite and quartz. The quantity of clean mineral taken was therefore 3·040 grams, while the percentage of CO_2 indicated was 16·22 %. The solution was treated with H_2S after addition of HCl to separate the copper, while the zinc was precipitated in the filtrate also with H_2S after alkalising with ammonia, the absence of iron having been already

ascertained. After separating the zinc the filtrate was concentrated b evaporation and the lime precipitated as oxalate. The bulky copper an zinc sulphide precipitates were each dissolved and made up to 250 c.c., which 50 c.c. were taken in each case for assay in duplicate, the copper bein precipitated with caustic potash and weighed as CuO, while the zinc wa precipitated with Na_2CO_3 and calcined to ZnO. Very concordant result were obtained, the duplicates for copper yielding 19·87 and 19·96 p.c CuO, while those for zinc gave 54·85 and 54·69 p.c. ZnO.

For water a quantity weighing 2·432 grams was heated graduall over a good spirit lamp in iron crucible jacket till constant, the los being 0·591, equivalent to 24·32 p.c. of carbonic acid and water. Th residue still contained carbonic acid equivalent to 0·40 p.c., so that onl 15·82 p.c. had been driven off together with 8·50 water.

The results were :—

H_2O	8·50
CO_2	16·22
CuO (mean)	19·91
ZnO (mean)	54·77
CaO	0·46
SO_3	trace
	99·86

The lime may probably be regarded as extraneous, being due to t inclusion of minute granules of calcite. It is plain that the mineral aurichalcite, resembling the variety analysed by Risse, from Santander, given in Dana. The percentage of water is, however, less than would required to satisfy any of the formulæ given by Dana, and is in fa insufficient to form the ordinary hydrates of the metallic oxides. We m therefore suppose either that the original hydrates were somewhat mo basic than the theoretical composition, or that in the long exposure this very dry atmosphere they have lost some of their originally combin water ; and this latter does not seem an unreasonable supposition wh we remember how comparatively unstable are the hydrates of copper a zinc.

The original source of the zinc was at first matter for curious speculati since no other zinc mineral has ever been noticed in the mines i indeed within at least a couple of miles. On analysing the decompo chalcopyrite, which is the prevailing ore of copper, the source of the z became at once evident, since even after an oxidation and decomposit which has removed practically all the sulphur no less than 0·84 p.c. zinc remains in the residue,

2.—On a peculiar decomposed Chalcopyrite.

The original source of all the copper minerals occurring in the Torreon es, among which may be mentioned chalcocite, malachite, azurite, rysocolla, was undoubtedly the chalcopyrite brought up in the great ous masses of garnet rock which form so prominent a feature of the lity; but curiously enough the occurrence of this mineral in an tered condition is extremely rare. The characteristic tetrahedral is frequently recognisable in somewhat confused aggregations of sized crystals, but the colour has mostly disappeared, the crystals on ture are found to have a general dull blackish appearance, and are n covered with a drusy coating of malachite. There are, however, ys to be seen in the fracture specks and patches showing a metallic re and usually retaining their original yellow colour, while from the ner in which these are disposed, being most concentrated towards the re, it is evident that the decomposition proceeded inwards from the r surface along innumerable cracks forming an intricate network, h is most distinctly visible where the oxidation is incomplete, and in h no trace of system or regularity is discoverable.

or analysis those specimens were selected in which the decomposition proceeded as far as possible, but even in the dullest and blackest small ks of undecomposed chalcopyrite could be easily distinguished. her with the chalcopyrite itself —often indeed absolutely enclosed he large crystals—were found cubes of iron pyrites completely erted into oxide, and in addition minute crystals of quartz and te, which it was impossible to completely separate with the aid of a . A large quantity was coarsely broken and picked out as clean as ible, yielding on analysis the following results :—

SiO_2 (adventitious)	5·52	
CuO	33·34	=(26·62 p.c. Cu)
Fe_2O_3	41·97	(=29·38 p.c. Fe)
ZnO	1·26	
CaO	0·81	
CO_2	6·86	
S	1·53	
Combined water	8·22	
	99·51	

he perfection of the oxidation is remarkable, for the amount of yellow tered chalcopyrite in the sample taken for analysis was certainly very

nearly sufficient to account for 1·5 p.c. of sulphur out of some 33 p. originally present: it follows therefore that the perfectly clean dull bla portions must be almost absolutely free from sulphur, probably containi less than 0·5 p.c.

The carbonic acid is probably derived from minute veinlets and caviti filled with malachite, which run through most of the crystals and cou not be separated, and from portions of the malachite coating not complete scraped off.

The proportion of iron is somewhat in excess of that which wou correspond to a typical chalcopyrite, and if the zinc replaces copper t difference is still more marked, since taking the mean of the analys quoted by Dana a typical chalcopyrite should contain for 30·79 p.c. Fe less than 32·23 p.c. Cu. It is most probable that the missing copper we to form the coating of little drusy crystals of malachite covering the lar tetrahedra, which was scraped off as completely as possible before breaki them up for analysis; and if the crystals had been analysed as a who coating included, probably the proportions of iron and copper would ha been about normal.

We might also suppose that a portion of the copper had been leach out while the iron remained, but such leaching could only be effected by a solutions removing the copper as sulphate, which hypothesis seems me quite incompatible with the constant presence of malachite in connecti with this chalcopyrite, and the *entire absence of the sulphates of iron a copper, both neutral and basic*, not a single specimen of any of which l been observed in the whole locality.

This remarkable fact has led me to the conclusion that acid soluti played no part in the decomposition, neither was this due to ordina atmospheric oxidation, such as may be constantly noted in connect with large pyritous masses containing copper. It seems to me that decomposition most probably took place quite apart from the influence atmospheric oxygen—i.e. at considerable depths from the surface, and t the decomposing agent was simply heated water containing more or l carbonic acid and bi-carbonate of lime in solution. The monosulphi of iron and copper are, as is well known, acted upon by steam with production of H_2S: and we might expect the more powerful agent, sup heated water under pressure, to be fully capable of attacking chalcopyr which is half a monosulphide ($CuFeS_2$ being probably Cu_2S FeS Fe The constant occurrence of calcite in these ore-deposits, together with malachite, lends additional confirmation to this hypothesis, since i difficult to see how this mineral can have existed or have been formed

presence of soluble sulphates or acid solutions. The reactions which k place may perhaps be explained by the following equations:—

$$2CuFeS_2 + 5H_2O = 2CuO + Fe_2O_3 + 4H_2S + H_2$$

$$2CuFeS_2 + CO_2 + 6H_2O = \underbrace{CuCO_3.CuH_2O_2}_{\text{Malachite}} + Fe_2O_3 + 4H_2S + H_2$$

asionally are found in the malachite spots, "eyes" or kernels of lcocite, and it seems to me that such an occurrence of this mineral rds additional support to my theory, since the very gases liberated by former reaction may have reacted upon some of the oxide of copper viously formed, in places where there occurred an accumulation of the es together with more or less deficiency of water, and probably at wer temperature, so re-forming a sulphide of copper; but in this case subsulphide, according to the equation

$$2CuO + H_2S + H_2 = Cu_2S + 2H_2O.$$

subsulphide once formed would not be likely to be again decomposed, g much more stable and less likely to oxidise than the CuS originally ting in the chalcopyrite.

am not aware that this theory of the decomposition of chalcopyrite ever been suggested before. The peculiar circumstances of this lity have forced it upon my attention as the only one which succeeds explaining the observed facts, but it seems probable that further estigation will prove its applicability to many other localities where lcopyrite, malachite, and chalcocite occur together, or where the two er alone remain. It will probably be found in the majority of cases t the former mineral was the original source of the copper, both achite and chalcocite being of secondary origin, and in not a few cases ill be found that the decomposition proceeded in the manner above ribed.

Note on Crystals of Manganite from Harzgerode.

By Frank Rutley, F.G.S.

[Read November 10th, 1891.]

ON examining a specimen of manganite from Harzgerode, consisting iron-black crystals of apparently long-prismatic habit, it w found that they were, in most instances, composed of many individu crystals, the latter ranging from about two to four millimetres in lengt As they seem to differ in habit, so far as I know, from the crystals manganite hitherto described and figured, a short account of the pending more careful investigation and measurement, may be of intere

In some cases individual crystals of small dimensions occu In these the dominant form is the rhombic prism {110} = 99°4 combined with the macroprism {210} = 134°15′ together w curved faces which approximate to those of a steep verti pyramid, while the basal planes, when present, are only rep sented by very diminutive and somewhat convex faces. T edges in which the faces of the prism and the more or le convex pyramid faces meet are slightly but distinctly curve the curves springing from the obtuse edges in which the fac of the prisms {210} and {110} intersect, and meeting on the acute edg of the prism {110} in points situated much further from the origin. T curvature of the pyramid faces is more clearly perceptible on the acu than on the obtuse polar edges of the pyramid. These faces are se under the microscope to be somewhat irregularly traversed by two sets striæ, one set, the more strongly marked, lying in the direction of t obtuse polar edges of the pyramid, while the other striæ cross those of t preceding set obliquely, and at angles which appear to diminish as t striæ approach the terminations of the crystals. It seems probable th the curved pyramid faces represent either an oscillatory combination pyramid and prism faces or a series of pyramids. A number of sm crystals, such as those just described, when grouped parallel to {110} g rise to stout prisms with jagged ends, each of the spikes representing t

inal portion of an individual crystal. Several of these composite
ns in the specimen are seen to consist of two or more sets of prisms
rposed, the grouping in each set being the same, namely, parallel to
e of the prism {110}. This method of superposition involves the
lap of one tier slightly beyond that of the tier which succeeds it, so
the composite prisms appear to taper to a very small extent.
pecimens of manganite from Ilfeld do not seem to show any crystals
e habit here described.

Analysis of Aragonite from Shetland.

By J. Stuart Thomson.

[Read November 10th, 1891.]

FEW, if any, analyses of British aragonites have been published ; t which I now submit was executed upon a specimen forwarded to by Professor Heddle, who has supplied me with the following notes of occurrence.

It was obtained by him at Sobul Hill, in Unst, Shetland.

The west side of the hill of Sobul is pitted for the extent of nearl mile with quarry holes, opened in a search for chromite.

The material which was wrought seems to have occurred after manner of an irregular vein, with occasional nodular masses. Much r had to be raised to win the substance sought after ; and both this r and that substance yet remain, the latter built into stacks.

The inferior chromite, which was formerly wrought near Balta So in Unst, had very much the appearance of coarse-grained gunpow sprinkled throughout a yellow clay ; when it became valuable the d granules of chromite occurred in such proportionally large amounts as coalesce or even to exclude the matrix, which is a massive granular pentine.

The appearance of the masses now stacked together is very simi their specific gravity and their hardness, however, are much less, and t composition is very different. The serpentine matrix is much the sa but the darker granules and masses are of the nature of an impure p tite—there being sometimes only traces of chromite.

Dr. Heddle is of opinion that if chromite is to be regarded as esse to the rock *dunite*, then this as a whole may be regarded as a methyl *dunite* ; the chromiferous spinel having given place to the magnesian The quality of all the Shetland chromite was always dependent upon amount of magnesian replacement.

On the south slopes of Neuker and Nicaford Hills Dr. Heddle found pure picotite—transparent in microscopic sections. Such s

s are not to be distinguished by the eye, either from poor chromite or tbe substance here brought to the surface.

ne aragonite sent me was found by Dr. Heddle in veins along with ious serpentine. Cavities in these veins contained radiating groups ystals of aragonite, which were over two inches in length by half-an- in thickness. Such groups had all the normal appearance as well as rystalline form of aragonite. The radiations were in flat arrange- ts in the narrow cavities.

ccasionally, however, the serpentine was absent, and the rent was ly filled by grouped bundles of crystals which passed transversely ss the vein, filling it completely, and radiating from one side only.

nough the stoutness of the crystals and the nature of the matrix alike ived the supposition that this was a zeolite, the appearance was that olitic arrangement. As there was a decided pearly lustre in some ons, and as the hardness was not only greater than that of calcite, omewhat superior to that of the associated aragonite, Dr. Heddle ome hope that these crystals would prove to be *hydrodolomite*, a ral which he had found in a northern locality in Unst, and in this he requested me to analyse them.

found their specific gravity to be 2·876, and upon analysis I ob- d : —

Calcium Carbonate	...	...	...	=	98·77
Magnesium	,,	...	...	...	=	·50
Water...	...	...	...	...	=	·76
						100·03

ey are thus merely aragonite. The large crystals of recognised ara- e yielded 0·53 per cent. of water—no unusual amount for this ral.

Orpiment.

By H. A. Miers, M.A.

[Read January 26th, 1892.]

THE crystalline form of orpiment was first determined by M (*Grundriss der Mineralogie* (1824), 2, 613).

His measurements, which he is careful to state were only approxim gave an angle of 79°20′ for the prism, and 83°37′ for the brachydo the plane of perfect cleavage being taken as the macropinakoid, and crystals being referred to the orthorhombic system.

The observations of Mohs were made upon crystals from Tajowa, these, like the orpiment from other localities, are very uneven and l rounded faces.

Breithaupt on the other hand, from his own observations, supp the mineral to be mono-symmetric. (*Berg-und Hüttenmännische Zei* 25 (1866), 194.)

Krenner has subsequently measured crystals from Bosnia, and fo for the prism angle 77°14′, and for the angle of the dome 82°34′.

(*Földtani Közlöny* 13 (1883), 269, 381, and 14 (1884), 107.)

Nothing has hitherto been recorded concerning the optical characte the mineral; the crystals are not sufficiently transparent, they are soft to afford artificial sections, while the cleavage laminae are very ible and do not show any interference figure.

Considerable interest is attached to any indications of the symmet orpiment which may be supplied by its optical characters; firstly, bec the goniometrical measurements are not good; secondly, because though the other sulphides of the same isomorphous group are ops Drude's experiments on the reflection of light at its cleavage surface cate that stibnite may possess the symmetry of the mono-symmetric, not of the orthorhombic system. (*Ann. d. Phys.* 34 (1888), 489.)

At Tajowa, near Neusohl, in Hungary, where the best available cry are found, the orpiment occurs as nodules and isolated crystals in or in a calcareous marl. The larger crystals, which are probably

herto used for goniometrical measurements, are very uneven, and have rved faces especially in the zone which contains the cleavage face and pyramids.

This marl sometimes contains minute crystals disseminated through its ss, and when it is dissolved in hydrochloric acid the clayey residue is nd to contain numerous microscopic prisms of orpiment.

n this way it is possible to extract from the marl the most beautiful le crystals, which not only have sharply defined edges, but are nearly nsparent; they present a combination of the prism with the brachy- ne.

When examined under the microscope the prism faces are found to give traight extinction, and through each emerges nearly normally an optic s showing a very marked dispersion; through each pair of prism faces optic axis is inclined at about 4° to the normal. This result is in plete accordance with the requirements of the orthorhombic system, i shows that the basal plane is the plane of the optic axes, the brachy- gonal is the acute bisectrix, and the true axial angle is very nearly ual to that of the prism faces.

The dispersion, moreover, is very strong; $\rho > v$.

Measurements made upon the best available crystal gave the following ults.

Prism angle = 79°27′.

Angle between the optic axes as they emerge in air through the prism es = 70°24′ for sodium light (line D).

For the line C this angle is about	...	...	76½°
For the line E ,,	,,	...	... 66½°

Attempts to measure the obtuse axial angle in oil through a cleavage ce were not successful.

REVIEWS.

Synthèse du Rubis. Par E. Fremy, Membre de l'Institut, Directe du Museum d'Histoire Naturelle. Paris (Vve. Ch. Dunod), 1891.

In this work M. Fremy gives the results of his laborious investigatio on the artificial production of the ruby. As it was necessary to car out many of the operations on a large scale, he originally associat himself with the late M. Feil, the eminent glass-maker ; and in 1877 th were in a position to announce their first successful experiments. that time M. Fremy used, as the raw materials for his synthesis, mixture of alumina, red lead, and potassium bichromate. By calcinati of this mixture, a lead aluminate is first formed, and this is then decompos by the silica of the fire-clay crucible, with production of a fusible le silicate and separation of alumina. The alumina appeared in brillia red laminæ having the properties of the natural ruby, but always lamell and friable, so as to be of no practical use.

After years of labour spent on attempts to improve the process, it w found impossible to obtain the alumina in large and thick crystals, and Fremy at length determined on a new departure in his researc Assisted by M. Verneuil, he attempted to obtain the crystallised alumi by the aid of certain vapours, especially those of fluorides, and w ultimately rewarded by securing thick rhombohedral crystals. T materials usually employed in his later experiments were alumina, bari or calcium fluoride, and potassium bichromate. The colouring medi was in all cases potassium bichromate, the alumina being mixed wit or 4 per cent. of this salt. As it was essential that the alumina sho be very pure, recourse was had to the calcination of ammonia alu purified with great care. The best results were obtained by associati the alumina with more or less potassium carbonate ; the presence of t alkali, though not absolutely necessary, facilitating the formation of t crystals. The mixture was exposed to prolonged calcination at abo 1500°C., and the circulation of moist air through the crucible was fou essential to the reactions. The moisture disengages hydrofluoric a from the fluoride, and this appears to effect the isolation of the alum which has combined with the alkali, or alkaline earth, and induces crystallisation. Another mode of viewing the reaction is to assume t

uminium fluoride is slowly formed, and then decomposed under the ence of moist air, with formation of hydrofluoric acid and separation ee alumina. The red alumina appears to present all the physical acteristics of the natural ruby, and may be cut and polished as a gem, sed in the jewelling of watches.

. Fremy's monograph is amply illustrated by a series of beautiful s from photographs mostly taken by M. Dujardin. F. W. R.

s Méthodes de Synthèse en Minéralogie. By Stanislas Meunier s, 1891).

. this excellent work the methods of production are taken as the of the arrangement. The result has been to make the book for the part far more readable and interesting than many other works on ame subject.

the introduction the author gives a clear statement as to the services h mineral synthesis can render to science: (1) in enabling us to in types of simple composition of species, which in Nature consist of orphous groups; (2) in completing series of compounds of which e possible terms are not realised in Nature; (3) in procuring perfect als of very rare species, or of species which are only met with in phous masses, so as to allow of the crystal measurement and complete ical investigation of the mineral; (4) in elucidating the problem of rigin of minerals and rocks in Nature. The book is divided into three ons, dealing respectively with (1) the normal production of con- oraneous minerals in Nature; (2) accidental syntheses; (3) experi- al or rational syntheses. In each section the three methods of uction—by the igneous or dry way, by the mixed way (water heated r pressure), and by the wet way—are treated in turn. The first on contains a necessarily brief account of the mineral products which actually in process of formation at the present time, as the result of anic action, deposition by thermal springs and salt lakes, weathering cks, etc. Only a rapid review of so vast a subject is given, but rences to the more recent work on this subject are treated more fully, e.g. the interesting description of the calcareous and siliceous ations in the Mammoth Springs, due to living algæ.

the second section the accidental mineral syntheses which take place undries, etc., are described. A complete account is given of Daubrée's stigation of the different mineral species, including tetrahedrite and tes, which resulted from the action of the thermal waters of the

spring of Bourbonne les Bains upon the coins which had been cast in votive offerings centuries before.

The arrangement of the third section, which forms the main portion the book, is very systematic. It is divided like the others into th parts, dealing with processes in the dry, mixed, and wet way; and each of these divisions five chapters are devoted, which treat respectiv of methods of simple crystallisation, simple decomposition, conjugati precipitation, and double decomposition.

Under the head of precipitation by gases in the dry way is a v interesting account of the author's own experiments on the synthesis meteorites. His method consisted in reducing by hydrogen mixtures different proportions of the chlorides of iron and nickel. The conclus drawn from these experiments is that the most frequent types of meteori do not result from fusion, but simply by way of concretion at the expens vapours reacting one on the other. The same idea is extended to breccias containing the native platinum of the Urals, and also to Ovifak iron, except that in the latter case carbonic oxide and not hydro is supposed to have been the reducing agent.

Altogether it may be said that, although we already possess sev books on mineral synthesis, including the well known work of Fou and Lévy, the thoroughly readable form into which the author has thr the whole subject matter of the present volume, and the amount of rec work which he has introduced, render it a far from superfluous addit to the literature of the subject. G. T. P.

Abstracts.

somorphism.—On this subject, with special reference to dolomite and
er rock-forming minerals, a valuable paper is contributed by J. W.
gers to the *Neues Jahrb. f. Min.* (1891, Vol. I., p. 132.) In the case of
l isomorphism, *e.g.* K-alum and Tl-alum, crystals can be obtained re-
senting mixtures of the two salts in any proportions whatever, and pro-
ies of these mixtures, such as their density, agree with those calcu-
d from the two salts. Thus, if abscissæ be taken to represent the per-
ages by weight of one of the two constituents, and ordinates to repre-
the specific volumes of the corresponding mixtures, the extremities of
e ordinates will give a straight line sloping down from the less dense
he more dense of the end members. This holds provided the two salts
closely similar in crystallographic elements, &c., but with greater
rences, the mixtures show internal strains giving rise to optical
malies, which are most pronounced in the middle members of the series.
h still greater differences in the angles or molecular volumes of the
salts, the middle members of the series cannot exist, and a gap occurs.
diagram then shows an interrupted line, only the portions of it near
two ends being represented. An example of this is furnished by KH_2PO_4
$(NH_4)H_2PO_4$, which separately form similar quadratic crystals, dif-
ng, however, by more than 4° in the pyramid angle. Here the iso-
phism is imperfect.

different case is that of isodimorphism; *e.g.* between $MgSO_4 + 7aq.$
$FeSO_4 + 7aq.$, which belong to different systems, rhombic and mono-
ic respectively. Here the only possible mixtures are the Mg salt with
little Fe, and the Fe salt with but little Mg. The two short lines in
diagram are here portions of two different straight lines.

common case, especially among rock-forming minerals, is that in
ch two isodimorphous salts also form a double salt (a true chemical
pound, *e.g.* of equal molecules). Here we may obtain three different kinds
rystals: thus in the case of KNO_3 and $AgNO_3$ we get (i.) KNO_3 with
little Ag; (ii.) the definite compound $KAg2NO_3$; (iii.) $AgNO_3$ with
e K. Here the double salt is denser than the result calculated for a
ture of the two nitrates; also its melting-point is much lower than that
ither of the simple salts. It is represented on the diagram by an

isolated point lying below the two portions of straight lines. Such mi
ture as does take place between the two simple salts is due not to tr
isomorphism but to morphotropy, for though both rhombic, the two ha
very different habits, KNO_3 columnar and $AgNO_3$ tabular.

The author holds the case of calcite and magnesite, with the doul
salt dolomite, to be analogous to that just described. With extreme
few exceptions (explained by the material not having been homogeneou
the numerous analyses of natural carbonates of Ca and Mg fall under thr
heads, (i.) calcite containing but little Mg; (ii.) normal dolomite of co
position $CaMg2CO_3$; (iii.) magnesite containing but little Ca. Calculat
from the specific gravities of calcite (2·711—2·712) and magnesite (3·01
that of a mixture of the composition of dolomite should be 2·843; but t
observed figure is 2·872, the voluminal condensation proving the body
be a true chemical compound. Consideration of other physical and chem
cal properties tends to show that dolomite is a definite double-salt, a
that calcite is not isomorphous but isodimorphous with magnesite. C
cite is isomorphous with the carbonates of Sr, Ba, and Pb; magnesite w
those of Fe, Mn, and Zn. So also dolomite is isomorphous with cor
sponding double salts $CaFe2CO_3$ and $CaMn2CO_3$, the sum of the mo
cules of Mg-, Fe-, and Mn-carbonates in brown-spar being always equal
that of Ca-carbonate.

The case of the pyroxenes is interesting. Here the monoclinic wol
stonite $CaSiO_3$ is isodimorphous with the rhombic enstatite $MgSiO_3$. T
former can contain but very little Mg, and the latter but very little
They form the double salt diopside $CaMg2SiO_3$, which is not isomorph
with either of the simpler bodies. It presents morphotropy with ens
tite, but true isomorphism is precluded by the difference of crystal
graphic systems. Also wollastonite differs widely in many of its prop
ties from diopside, though in the same system. Enstatite is, howev
isomorphous with $FeSiO_3$, the mixtures giving rise to the series of br
zites and hypersthenes; while diopside is isomorphous with the cor
sponding double salt hedenbergite $CaFe2SiO_3$. The rule of Tschern
and Dölter, that in the non-aluminous augites the CaO (in molecules) is eq
to the sum of the MgO and FeO, seems to be generally confirmed, all
ance being made for non-homogeneous material having been analysed
some cases [perhaps even for ultra microscopic intergrowth: *cf.* T
on the augite of the Whin Sill, *Q. J. G. S.* Vol. XL., pp. 648-650, 188

In the olivine-group the simple lime-salt Ca_2SiO_4 is not known, but,
before, we have the other end-member forsterite Mg_2SiO_4 never contain
more than a very little Ca, showing that the Ca- and Mg-compounds are h

in not isomorphous but isodimorphous. Further we have the double salt
aticellite of definite composition $CaMgSiO_4$, presenting not isomorphism
only morphotropy with forsterite. Although crystallising in the same
em and with tolerably similar habit, their crystallographic elements show
e differences. These differences are much less in the case of forsterite
fayalite Fe_2SiO_4, which are truly isomorphous, and give rise by their
tures to the ordinary olivine series.

The author gives other examples, such as the rhombic minerals FeS_2,
As, and $FeAs_2$. He also considers that isodimorphism is not impos-
e even between two compounds both crystallising in the regular sys-
, such as KCl and NaCl. A. H.

Experiments upon the Constitution of the Natural Silicates. F. W.
ke and E. A. Schneider (*Amer. Journ. Sci.* 40 (1890). pp. 303, 405,
; describe certain experiments conducted with the object of discriminat-
between alternative formulæ in the case of some of the silicates. These
riments, which relate to 16 of the magnesian silicates, consisted in sub-
ng the minerals to the action of *dry* hydrochloric acid gas at a tem-
ture generally between 383° C and 412° C (the fusion points of lead
e and zinc), and comparing the action of the dry with that of
eous hydrochloric acid; determinations were also made of the amount
ea liberated on ignition (subsequently dissolved out by soda solution),
of the water given off at different temperatures. The following were
e of the principal results:—

Talc loses its water at red heat, but is almost unacted upon by both
eous and dry HCl. The mineral is commonly regarded as an acid meta-
ate $Mg_3H_2(SiO_3)_4$, but is considered by Groth to be a basic pyrosilicate
$Si_2O_5)_2(MgOH)_2$. The authors find that their experiments support
commonly received formula; the stability of the mineral towards acids
against Groth's view, since the univalent group MgOH should be
ble in HCl; if, on the other hand, talc is a metasilicate, it should, on
tion, split up into $3MgSiO_3 + SiO_2 + H_2O$, so that one fourth of the
a would be set free; and this appears to be the case, since when heated
alf-an-hour, it gave up 15·36 per cent. of silica, extracted by subse-
nt boiling with solution of sodium carbonate.

Serpentine gives up all its water at red heat, but not before; it is
gly attacked by dry gaseous HCl, and gives up about 15 per cent.
one third) of its magnesia; the mineral is easily decomposed by
eous HCl, and gives up all its silica; on ignition it is decomposed into
$O + Mg_2Si_2O_7$; and on further heating the latter molecule is split up
$Mg_2SiO_4 + MgSiO_3$, *i.e.* into a mixture of olivine and enstatite.

From these facts the authors regard $Mg_2(SiO_4)_2\,H_3\,(MgOH)$ as t most probable constitutional formula of serpentine. In accordance wi the previously published views of Clarke upon the constitution of t complex silicates, this may be regarded as a substitution derivative of normal orthosilicate such as olivine $Mg_4(SiO_4)_2$.

3. Chlorite gives up its water at red heat; subjected to the action HCl, different varieties behave differently; ripidolite treated with gase HCl gives up 13 per cent. of magnesia; if this represent MgOH the cons tution may be generally denoted by $R''_2\,(SiO_4)_2\,R'_4$, which is an olivi formula with one half of the R'' replaced by R'_2, and refers chlorite to t same series with serpentine.

4. Phlogopite gives up most of its water on ignition, is almost unaffec by gaseous HCl, but is completely decomposed by aqueous hydrochloric ac

The results are in accordance with Clarke's theory of the mica gro according to which these minerals are substitution derivatives of normal aluminium orthosilicate $Al_4\,(SiO_4)_3$, as follows :—

Muscovite	$Al_3(SiO_4)_3KH_2$
Biotite	$Al_2(SiO_4)_3\,Mg_2R'_2$
Phlogopite	$Al\,(SiO_4)_3\,Mg_3\,R'_3$

The composition of the phlogopite from Burgess, Ontario, for instanc $Al(SiO_4)_3Mg_3KH_2 + Al_2(SiO_4)_3\,Mg_2K\,(MgF)$.

5. Vermiculite loses 10 per cent. of water by drying over sulph acid, 4 per cent. below 300°, and the remainder at red heat; the min is little affected by dry HCl, losing only 3 per cent. of magnesia; bu completely decomposed by aqueous HCl.

One of the two examples analysed was the jefferisite from Westches to which after discussion of these results the authors assign the form $AlO_2MgSiO_4R'_3.3H_2O + Al_2(SiO_4)_3Mg_2H_2{\cdot}3H_2O$, *i.e.* a mixture of a hyd clintonite and a hydro-biotite, the alkalies being replaced by hydrogen, the R' being partly (about one third) MgOH; one molecule of the w is given off below 300°.

As a result of all their experiments the authors conclude that in magnesian silicates only that part of the magnesium is attacked gaseous HCl which is present as the univalent group MgOH; for oliv is unattacked, and serpentine is attacked proportionally to the excess oxygen over the orthosilicate ratio. The new method of investiga promises to be of considerable value in determining constitutional form and the authors propose to continue their researches among other silica

H. A. M

Formation of Minerals in Slags and Lavas compared.—Continuing researches on the minerals of slags (see p. 240 of volume IX.) H. L. Vogt deals at length with the minerals of the melilite-group, viz. genite, melilite, and a new non-aluminous silicate named akermanite, known in natural rocks. These substances crystallise out from basic mas very rich in lime, and containing not too much magnesia, ferrous e, alkalies, &c. If little or no alumina be present, akermanite is ned. This group of tetragonal silicates seems to form a graduated es from akermanite to gehlenite, the constitution of the two end-nbers being (where R = Ca, with less Mg, Mn, Fe, Na_2):

Akermanite, $R_4Si_3O_{10}$ or $R_3(RSi)Si_2O_{10}$,
Gehlenite, $R_3Al_2Si_2O_{10}$ or $R_3(Al_2)Si_2O_{10}$,

which the hexatomic groupings (RSi) and (Al_2) replace one another. rmanite is optically positive, giving $\varepsilon - \omega = 0{\cdot}005$, and has a specific ity 2·75; gehlenite is optically negative, giving $\varepsilon - \omega = -0{\cdot}006$, has a specific gravity about 3·05. The natural and artificial melilites intermediate, the ordinary rock-forming melilites having a very feeble ble refraction of negative character. The member of the series which sts of the akermanite and gehlenite silicates in the ratio 6 : 4, corre-ding to about 10·9 per cent. of alumina, is isotropic, dividing the tive from the negative members. To explain the chemical structure the group the author introduces a new hypothetical silicic acid yrosilicic") of formula $H_8Si_3O_{10}$. The remainder of this second paper ains brief notices of anorthite and garnet as constituents of slags, the er mineral being formed only extremely rarely and in small quantity. *chiv. for Math. og Naturvid.* Vol. XIII. p. 310.)

The third paper (*Ibid.* Vol. XIV. p. 11; 1890) deals with the spinels, gnetite, and other minerals. The magnesia-spinel, with some lime, Ca) Al_2O_4, is frequently observed, but only in basic magmas in which nina and magnesia are plentiful. It always separates out before the ates. In slags containing zinc, zinc- or zinc-iron-spinel is formed, the er of separation of the minerals in such a slag being (i.) sulphides of and zinc; (ii.) zinc-spinel; (iii.) magnetite; (iv.) fayalite, leaving ly some glassy residue. The iron-spinel hercynite, however, does not n easily even in basic slags rich in alumina and ferrous oxide.

The spinels tend to form good crystals, but magnetite usually builds etons or rounded grains. The latter forms much more easily from basic from acid magmas. When it occurs with spinel it is either of later ration or intergrown with that mineral. The relation of magnetite to

the olivine-minerals in order of separation from the slags is found to va even in cases where the conditions of cooling were the same, and t variation seems to be related to quite small differences of chemical co position.

Hausmannite, Mn_3O_4, easily forms from slags, in crystal-skeletons li those of magnetite, and manganoferrite $(FeMn)_3O_4$ also occurs. Hæmat was not found in any of the slags examined by the author, though it h been produced artificially by Fouqué and Michel Lévy.

Corundum was not found in any of the slags examined. Even fr magmas very rich in alumina that substance does not readily separ out as such. The author points out some very interesting and import facts respecting the influence of the content of alumina in a magma upon t crystallisation. In a magma with little or no alumina, the non-alumin silicates will separate out in crystals of some size even under comparativ rapid cooling, and if the composition of the magma be not very differ from that of the minerals most easily formed, the whole will crystalli If, however, a small quantity of alumina be present, the crystals of th minerals do not reach so large a size; with more alumina the crystallisat is more hindered, though all the other conditions remain the same, a glass is formed. With a higher percentage of alumina the whole cons dates as glass. Even for aluminous minerals the crystallisation is retar by any excess of alumina above what is required.

The remainder of this part of the paper treats of various sulphides a of apatite. A. H.

The Serpentines of the East Central Alps and their Contact-phenom (E. Weinschenk: *Ueb. Serpentine aus den östl. Central-Alpen u. de Contact-bildungen*; Habilitationsschrift; 56 pp., Munich, 1891).

The district specially studied is the southern slopes of the Venedi *massif*, but the author prefaces his dissertation with a good summary modern opinions as to the origin of serpentines in general. In the trict considered these rocks do not occur in stratiform sheets, but in m sive fashion, breaking through the adjacent rocks, which are in general chlorite-schists and calc-mica-schists succeeding the Central Gneiss. T serpentine-rocks are composed mainly of serpentine with the latti structure which belongs to that derived from pyroxene, the mesh-str ture of olivine-serpentine being noticed in one instance only. In s cases remains of a diallagic augite are still to be seen, but there is trace of rhombic pyroxene or of felspar. Little flakes of talc occur am the serpentinous material, and there is magnetite both original

ndary. It is clear that these serpentinous rocks have been formed by alteration of pure pyroxenites, composed mainly of a diallagic augite diopside.

hat these rocks occurred as intrusions is proved, among other con-rations, by the phenomena exhibited at the contact of the serpentines the adjacent rocks. In the falls of the Islitz the serpentine takes on s margin a schistose character, with abundant development of tremo- &c. In contact with it is an "omphacite-like" rock consisting of olite, grey limestone, &c., with infiltration of serpentine. This zone, etimes several metres in width, is succeeded by a complex of crystal- silicate-rocks, which in part recall eclogites and allied rocks, and are lime-silicate-hornfels, similar to those seen in other districts where stones rich in silica (such as the calc-mica-schist of this locality) have invaded by igneous intrusions. In part these rocks are garnet-horn-, but this mineral is not found in the zones nearest to the serpentine, ote and diopside occurring there instead, besides a blue amphibole apparently plagioclase. The garnets often show lamellar double-action, and they are accompanied by idocrase, calcite, diopside, &c.

he serpentine of the Eichamwand is remarkable for the occurrence in pegmatitic veins composed of a lustrous diallagic augite in crystals up m inch in length, partly affected by serpentinous alteration. On the eck in the lower Isel Valley a serpentine mass exhibits an interesting ification in its marginal part. This is the occurrence of spherulitic regates of strongly pleochroic serpentine-substance in a colourless, appa-ly amorphous groundmass. The chlorite-schists which are in contact this serpentine have fissures filled with well-crystallised albite, epidote, ite, &c., covered by asbestos. The schists consist of alternating dark-n and light-yellow layers, the former characterised by actinolite, the r by epidote and plagioclase. The rock passes at a short distance a normal epidotic chlorite-schist.

n interesting mass on the western slope of the Kriselespitz contains entine of two different varieties, derived from diallage and olivine re-tively. Apophyses of serpentine proceeding from the main mass etrate the adjacent schists. They are of small width, and show a pact character, with the spherulitic structure already noticed as a ginal *facies* of the Sulzeck serpentine. In other localities noticed the rest is in the contact-metamorphism of the more or less calcareous sts adjoining the serpentine, which gives rise to epidote-hornfels (with ioclase, epidote, and actinolite), diopside-hornfels, &c. At one place, veen the Zopetnitz and Mullitz valleys, occurs a serpentine of brecciated

structure, large angular fragments of dark serpentine being imbedded in light-coloured serpentinous matrix, but whether this is a true breccia or produced by crushing and recementing is not clear. A. H.

On the Occurrence of Lavenite in the Nepheline-Phonolites of the Haute Loire. By M. A. Lacroix. *Bull. Soc. Fr. Min.* Vol. XIV. p. 15.

The mineral in question occurs in certain phonolites of the Haute Loire rich in nepheline and in microlites of ægirine.

The author has met with it in the rocks of Suc de Montusclat (la tortue) and also in those of Lardeyrols in the Ardennes.

The lavenite occurs in crystals elongated in the zone (100) (010). The greatest dimension seldom attains 0·25 mm. The mineral frequently assumes crystallitic forms in which numerous small needles, more or less nicked out, are grouped in the white constituents of the rock and give rise to the skeleton forms of large crystals.

The largest crystals are of a fine golden yellow with strong pleochroism:

$$c = \text{golden yellow.}$$
$$b \text{ and } a = \text{colourless.}$$

Consequently, in the vertical zone of elongation the sections (010) parallel to the plane of the optic axes (and therefore including a and c) and sections approximately parallel to this face are the only ones which are pleochroic and coloured.

The maximum pleochroism is transverse to the elongation, and this character greatly assists the recognition of lavenite in thin sections.

The crystallites are too thin to show any appreciable pleochroism, and they scarcely exhibit any double refraction.

The monoclinic character of the large crystalsis easily recognised. On (010) the direction of maximum extinction makes an angle of 20° with the face (100), and it is the axis of greatest elasticity a which makes this angle with (100); the sign of the axis of elongation is, therefore, always negative. Twinning on (100) is frequent, sections parallel to (010) showing symmetrical extinction on either side of the trace of the twinning plane. The maximum double refraction is 0·03.

The foregoing characters, taken in conjunction, sufficiently show that the mineral in question is lavenite. The attempt to isolate a suitable amount of the mineral for analysis was unsuccessful.

The lavenite was formed during the second period of crystallisation. The crystals are sometimes attached to the felspars of the first consolidation. F. R.

Note on the Orthoclase Felspar of the Basalts of Royat." M. Ed. nettaz. *Bull. Soc. Fr. Min.* XIII. pp. 372-6.

he felspars described in this paper occur in a rock composed of frag- its of basalt cemented by calcite, forming a small hill known as the Montaudoux, rather more than a kilometer from Royat (Puy-de- ne).

he basalt consists of an aggregate of crystals of augite, labradorite, grains of olivine, with which sometimes zeolites, probably chabasite, also associated. Porphyritic crystals of felspar occur in the basalt ments, and although completely enveloped by the basalt, they are etimes separated from it by a greenish crust. They have a rectangu- form, but occasionally thin off into wedges at one extremity.

hese felspars fuse more readily than orthoclase into a semi-trans- nt glass, and they are not acted upon by concentrated hydrochloric . Their density varies from 2·55 to 2·62. They are almost as vitreous he felspars of trachytes. Two cleavages are present which, when care- measured, are found to be inclined to one another at 90°.

n basal cleavage-plates traces of cleavages parallel to 110 and $\bar{1}10$ be seen, and still more distinctly the trace of the cleavage 010.

e face 001 is traversed by irregular fissures. On the same face a tion similar to that seen in triclinic felspars is also met with, but striæ seem to disappear at a slight depth in the plate. Many of the tals show no striæ at all, or only in places.

n parallel polarised light, between crossed nicols, the direction of ex- tion on basal sections is parallel and at right angles to the trace of the vage 010, but it is rare to find plates of moderate size which give orm extinction over their entire areas. Irregular plates may be noted ese surfaces which extinguish parallel to their boundaries when the es themselves are parallel to the plane 010. These plates appear to espond to lamellæ, which have been turned one on the other, the rota- sometimes amounting to 7° or 8°.

is to be noted that a large number of lamellæ, parallel to the direc- of easy cleavage, behave like plates of orthoclase; some of them are ted and extinguish at about 3° with the striæ. These approximate to oclase. Sometimes a mixture of orthoclase and oligoclase may be rved in the same plate.

n plates parallel to 010 the direction of extinction makes 5° or 6° with race of the basal cleavage, on some, however, only 1°, these belonging to tals whose basal planes are striated over nearly their entire surface. former are evidently orthoclase, the latter oligoclase.

In convergent light the dispersion is seen to be horizontal; $\rho > v$. T angle of the optic axes for blue light (solution of ammoniacal copper sa is 33¼°: for red light (glass coloured by oxide of copper) it is 34½°. The apparent angles were measured in a very transparent plate of orthocla but in another which was rather turbid the optic axial angle was notab wider. Furthermore, in the latter there appeared in parallel light a re tangular grating of dark lines, making angles of 12° and 78° with the li joining the foci of the curves seen in convergent light.

These angles of the axes show that the crystals of orthoclase have be raised to a temperature of several hundred degrees; a temperature, ho ever, less elevated than that indicated in the observations of M. D Cloizeaux.

From the results of four analyses which agreed very closely, the auth gives the following as the percentage composition of this felspar:—

Silica	66·83	containing oxygen	35·643
Alumina	19·20	,,	8·965
Lime	0·60	,,	0·171
Potash	6·29	,,	1·071
Soda	6·80	,,	1·754
Total	99·72		

giving the formula $(Na_2O, K_2O, CaO)\ Al_2O_3\ 6SiO_2$. It is evident that t felspar contains more soda than potash. The amount of silica is sligh less than usual, owing, doubtless, to the admixture of small quantities oligoclase.

The striated crystals contain only 64·4 % silica, 21·9 % alumina, a about 1·5 % lime. This is not a pure oligoclase. F. R.

Secondary Felspar in Epidiorite. Dr. J. S. Hyland (*Scientific Pr Roy. Dublin Soc.* 1890, p. 405) discusses certain sheets and dykes epidiorite occurring in the limits of Sheet 17 of the Geological Survey Ireland (district South-west of Londonderry). In their original conditi these rocks were dolerites or even gabbros. Traces of the primary fe par indicate that it was labradorite, but the untwinned granules formi the mosaic of secondary felspar give on analysis (p. 409):—SiO_2 62·8 Al_2O_3 20·1, Fe_2O_3 2·6 (remarked on as abnormal), CaO 4·5, Na_2O 8· K_2O 0·36, HO_2 1·3. Total 100·20. This is shown to correspond to oli clase, and reference is made to Rose's statement of the frequent assoc tion of uralite and oligoclase felspar. G. C.

n Changes experienced in the Optical Properties of Common Horn-de through Heating. By M. Belowsky. *Neues Jahrb.* 1891, Bd. I. 91.

xperiments were made upon common green hornblende from Arendal, ner (Zillerthal), Russel Co. (New York), Campolongo and Cotocachi ador). Sections cut parallel to 110, 010, and 100, and also at right es to the axis *c*, were strongly heated in a platinum capsule over a sen's burner for about an hour. A remarkable change in the optical erties was found to result from this treatment.

he position of the directions of extinction, the colour, the pleochroism, the strength of the double refraction were found to have become pre-y those of basaltic hornblende. Sections of common hornblende, being thus heated, might, if their original character were not known, egarded as basaltic hornblende. F. R.

lestite from Mineral County, Virginia. G. H. Williams (*Amer. n. Sc.* 39 (1890). 183), describes a new occurrence of celestite, which nd in large crystals of a peculiar habit in an argillaceous limestone on West Virginia Central Railroad at Knobly Mountain. The celestite und with minutely crystalline calcite in pockets, and the crystals, h are deep blue to colourless, attain a length of 3 ins.; but they are ly remarkable on account of their habit being a combination of {144} with {100} {102} {001} {011} {110}. The predominant form is very acute pyramid {144}, which, being generally rounded, gives the als a lenticular form. Celestites of pyramidal habit, though rare, have described from several other localities, but acute pyramidal crystals to the form {144} have only been recorded from the marl of Haute ne, in France. The author calls attention to the remarkable resem-ce which these crystals bear to the well-known Sangerhausen pseudo-hs, which, though generally referred to gaylussite, are regarded by loizeaux as pseudomorphs after celestite; this similarity even extends e surface markings of the pyramid faces.

Crystals of a similar acute pyramidal habit also occur, though rarely, ng the large celestites recently found near Yate, in Gloucestershire, and ar to be also due to the predominance of the acute pyramid {144}. vo good specimens are to be seen in the British Museum Collection. r.] H. A. M.

Eckel in Olivine and Serpentine.—Chr. A. Münster calls attention to occurrence of nickel oxide as a constituent of olivine, serpentine,

steatite, &c., where it appears to partly replace the magnesia. Stromey first showed the presence of nickel-oxide in olivine from Giesen (0·37 p cent.), from Kosakow in Bohemia (0·33), and from Egypt (0·32). Othe have found it in olivines from North Carolina, California, Iceland, a Greenland. Stromeyer found from 0·22 to 0·45 per cent. NiO in seve serpentines and steatites from the neighbourhood of Röros, &c. Münst has analysed "garnierite or nickel-gymnite" from Foldalen in Norwa with the result

SiO_2	MgO	FeO	NiO	H_2O	Total
44·55	21·03	9·87	5·45	18·71	99·61

from which it is clear that the nickel-oxide replaces magnesia. (*Arch. f Math. og Naturvidensk.* Vol. XIV. p. 240, 1890.) A. H.

Thulite in the Trondhjem District.—This mineral is found at a localit little north of Hinderhejm Church, 21 km. North of Trondhjem. occurrence has recently been described by H. Reusch (*Christiania videnska selskabs forhandlinger, 1890, No. 7.*) The thulite, or manganese-bear zoisite, is of a beautiful rose-colour, with marked pleochroism. I accompanied by the red manganese-epidote (piedmontite) and some comm epidote. These are distinguished from the thulite by their higher pol isation-tints, as well as by their monoclinic character. The piedmon shows characteristic twinning. The minerals named are associated w granular crystalline quartz, which contains cavities with spontaneou moving bubbles. Under the microscope are seen also some felspar, acti lite, garnets, biotite, and little grains of (?) rutile. This thulite rock fo little patches in a gneissic granite, into which it graduates, and from wh it has doubtless been formed. The epidote and zoisite minerals derived chiefly at the expense of the felspar, and the gradual conver can be traced in specimens. The granitic rock itself contains s epidote and piedmontite. In the same district manganese-ores have b found near Leksviken Church. A. H

Natrolite, Galactite, and Mesolite.—A zeolite from veins in the ba of Kenbane Head, Co. Antrim, Ireland, has yielded Dr. J. S. Hy (*Scientific Proc. Roy. Dublin Soc.* 1890, p. 412) the follo analysis:—SiO_2 46·50, Al_2O_3 27·55, FeO trace, CaO 2·59, Na_2O 13 H_2O 10·10. Total, 100·02. The author discusses its relations, and r it to mesolite, variety galactite. It would have been interesting if crystallographic system of this mineral could have been determined, the reference to mesolite thereby strengthened. G.

docrase.—Prof. J. P. O'Reilly describes a yellow idocrase occurring in in of quartz, and associated with a ferruginous and manganiferous lode he townland of Calliagh, Co. Monaghan, Ireland (*Proc. Roy. Irish d.* 3rd ser., Vol. I., 1890, p. 446). An analysis by Mr. L. T. Spencer s :—SiO_2 40·06, Al_2O_3 16·03, CaO 37·46, Fe_2O_3 4·23, MnO 1·16,) 0·21, Na_2O 1·00. Loss on ignition, 2·07. Total, 102·22. Specific ity 3·3407. Notes are given as to previous discoveries of idocrase in and. G. C.

Zinnwaldite.—The first record of this mineral in Ireland is made by f. W. J. Sollas, in the *Proc. Roy. Irish Acad.* 3rd ser., Vol. I., 1890, 379. It occurs associated with the well-known topaz crystals in ies of the granite of the Mourne Mountains, Co. Down, and gives a arkably distinct lithium reaction in the Bunsen flame. Differences of ur occur in most of the crystals, giving a zonal structure in tints of n or violet; but the examples exhibiting the best lithium reaction are urless. The reference to zinnwaldite is based on the parallelism of optic axial plane to the clinopinacoid, lepidolite following the usual of the alumina-alkali micas. Observations show that an increase of optic axial angle takes place from the central portion of the crystal to margin, ranging, for instance, from 44°4′ to 52°6′; this, combined the differences of colour and of specific gravity in the zones, in- tes that the interior is richer in iron and magnesia than the exterior. re is evidence in similar cases in the Leinster granites that this is not ys due to change in the material successively added during growth, may result from the attack of the surrounding magma upon the dy consolidated crystal. A discussion of this by the same author rs in "Contributions to a Knowledge of the Granites of Leinster." ns. *Roy. Irish Acad.* Vol. XIX., p. 449 (1891). G. C.

Specimens from Wady-Halfa (2nd Cataract of the Nile).—Dr. J. S. and (*Scientific Proc. Roy. Dublin Soc.*, 1890, p. 438) has examined a ber of stone implements brought from this locality. Besides silicified d, used for hammer-stones, he finds a "Mica-bearing Vogesite" (p.). The quartz of the sand of the district is of granitic origin. G. C.

Leucite-rocks in Asia Minor, and Hypersthene-bearing Rocks in the easus.—The specimens were collected by H. Martin, and are described A. Lacroix (*Comptes Rendus*, Vol. CX., p. 302, 1890). The leucite-rocks n Trebizond are of two types: (i.) leucitite of black, compact aspect,

showing to the eye only green pyroxene and transparent trapezohedra leucite up to 1 mm ; (ii.) leucotephrite, a grey rough-textured rock show very small grains of leucite and larger crystals of augite up to 1·5 m The constituents of the leucitite are (first consolidation) olivine, pyroxe leucite, magnetite ; (second) leucite, augite and magnetite ; also (epige ing the leucite) christianite. The leucite is, at least in part, posterior the pyroxene. The leucotephrite consists of (first consolidation) pyroxe magnetite and leucite ; (second) augite oligoclase and magnetite w more or less glassy residue ; christianite has been formed both from leucite and from the glass.

The hypersthene-bearing rocks from near Batoum, West of Tiflis, n Borjom, &c., are of various types, the most interesting being andesi and trachytes, which are mostly very vitreous, poor in felspars of later consolidation, but rich in large crystals of oligoclase, biotite, hyp sthene, augite and hornblende. The hypersthene is often bordered hornblende. The last-named mineral is deep red-brown and intens pleochroic, with birefringence up to 0·06 and extinction-angle almost ze The black mica is remarkable for its wide optic angle ; 2E = ab 40°. A. H.

Elæolite-Syenite of Montreal.—A. Lacroix has made a study of elæolite-syenites near Montreal with the metamorphism which they exh (*Comptes Rendus*, Vol. CX., p. 1152, 1890). The rocks are usually f grained, though some coarse pegmatitic varieties occur, as in Norw The constituent minerals are apatite, sphene, zircon, ilmenite and m netite, pyroxene, amphibole of the barkevicite group, biotite, albite, ort clase and anorthoclase, sodalite, and nepheline ; also the rare mine ænigmatite and allanite ; and locally in the coarse-grained types, as phyllite. In the coarser rocks too ægirine is frequent, and second products of nepheline (cancrinite, analcime, mesotype, and hydronepheli The sodalite and nepheline are often transformed to secondary white m forming pseudomorphs comparable with gieseckite. The sphene, apa and ferro-magnesian minerals are enclosed by the felspars, which moulded by the sodalite and nepheline. The zircon is posterior to coloured minerals, and even to part of the felspars. There are veins fine-grained rock like phonolite.

As an " endomorphic " contact-modification the elæolite-syenite beco richer in pyroxene and poorer in amphibole, the triclinic felspars bec abundant, oligoclase predominating, and red-brown garnet and cancri are developed.

Metamorphism is also observed in the contiguous Silurian limestone, ch is thoroughly crystalline near the syenite. The line of junction is ked sometimes by a zone of garnet or cancrinite, sometimes by a ular mixture of pyroxene, garnet, and wollastonite. The minerals uced vary much from point to point, and there are patches composed sively of granular silicates (wollastonite, pyroxene, garnet, and some- s felspar and perofskite). A. H.

Trachytic, Andesitic, and Basaltic Rocks of the Upper Eifel.—A con- ution to this subject is given by K. Vogelsang in the *Zeits. deutsch. Ges.* for 1890 (Vol. XLII., p. 1). He describes the trachytes near erg as very similar to the Drachenfels rock. The porphyritic sani- s, up to as much as 8 cm. long, are either in rectangular columns elon- ed parallel to the *a*-axis, or in tabular crystals with large clinopinacoids. ile the columnar crystals at the Drachenfels are untwinned, these of erg show not only Karlsbad but also Manebach twins (the first record e sanidine of trachytes). The groundmass consists of microlitic fels- (mostly with the characters of sanidine), and some brownish isotropic with minute gas-pores. The other constituents are biotite, apatite, cetite, augite, pseudomorphs, ilmenite, zircon, and sphene, besides nests of tridymite. The analysis of the rock (I) resembles that of Drachenfels rock.

	I.	II.	III.	
TiO_2	—	3·10	2·04	
SiO_2	65·01	36·21	44·62	
Al_2O_3	18·27	47·43	33·33	
Fe_2O_3	0·84	not est.	7·32	
FeO	0·83	2·58	5·45	MnO trace
MgO	0·80	3·23	5·46	
CaO	1·50	0·19	0·12	
Na_2O	6·79	4·12	0·53	
K_2O	4·34	2·74	0·68	
Ignition	1·74	1·12	1·47	
	100·12	100·72	101·02	

Several types of hornblende-andesites are described, the hornblende ring the corrosion-border of magnetite and augite. The most inte- g point is the frequent occurrence in the andesite of the Bocksberg Rengersfeld of nodular, fragmental-looking, or streaky portions very ent from the surrounding rock. The constitution of these curious

patches is as follows: cordierite in rather rounded crystals with polysy thetic structure and characteristic pleochroism; andalusite in idiomorp prisms with the colour and pleochroism only capriciously develope sillimanite in rounded columnar colourless crystals, or in bundles of fi needles; felspar (mostly triclinic) either forming a matrix for the wh or, on the other hand, occurring only sparingly; hexagonal flakes of b tite; octahedra of green pleonaste, often with spinel twinning; corundu blue to colourless, in tabular crystals with large basal planes and diame up to 0·75 mm.; rutile, in brown grains enclosed by the cordierite a andalusite, and also in yellow prisms, often showing the knee-shaped the heart-shaped twin; quartz, in subordinate quantity only; sometim garnet in irregular rounded grains; zircon; and magnetite. Very vari combinations of these minerals occur, and the relations of the patches the surrounding matrix also differ in different cases. The diameter of t nodular inclusions varies from 0·5 mm. to 6 cm., and the streaky patc may be as much as 12 cm. long. Column II gives an analysis of patch consisting mainly of sillimanite, with felspar, corundum, pleona andalusite, rutile, biotite, and a little interstitial glass. Others have sillimanite. The angular and streaky patches often have a schist structure. Precisely similar inclusions occur in the Siebengebirge, only in the Wolkenburg hornblende-andesite, but also in the Drachen trachyte; while some of the volcanic ejectamenta of the Laacher present in some respects similar characters. The author gives str reasons for regarding such inclusions as fragments of crystalline schi probably of contact-metamorphic origin, caught up in the andesite mag which has partially melted them and given rise to a new formation minerals in them. Some of the cordierite and the pleonaste is of formation, and certain glass cavities in corundum and cordierite ascribed to the melting of enclosed biotite-flakes, &c. For the m of occurrence of the cordierite and pleonaste the author compares inclusions in the basalt of Kollnitz, and he has artificially imitated phenomena by placing a fragment of cordierite-gneiss in melted a site. Similar minerals to those in these Eifel inclusions are reco by Max Koch in inclusions in the kersantite of Michaelstein in the H but with the exception of cordierite. [The actual contact-metamorp of crystalline schists in the field is almost an untouched subject, altho G. H. Williams has described the phenomena observable in the Corth District, and shown the close analogy of the contact-products with Michaelstein inclusions. (*Am. Journ. Sci.* (3) Vol. XXXVI., p. 1888.) Here cordierite is absent. See, however, the following abst of Salomon's paper.]

n conclusion the author briefly describes the phonolite of Selberg, near ldelbach, and various basalts, nepheline- and leucite-basalts, and neline- and leucite-basanites. A. H.

'etamorphism of Crystalline Schists at contact with the Tonalite In-ion in the Adamello Mountains.—A valuable memoir by W. Salomon, ing with this subject, appears in the *Zeits. d. deutsch. geol. Ges.* (Vol. I., pp. 450-556, 1890). The district examined is the western slope of te Aviolo and the neighbouring Val Moja, near the Austro-Italian tier. Here the so-called tonalite mass (described as a quartz-mica-blende-diorite, though it might with equal propriety be termed blende-granite) breaks through a succession of phyllites, quartzites, sses, &c., and produces in them metamorphism of a highly interesting l.

he upper part of the succession (quartz-phyllite group) consists of rnations of quartzite and phyllites with subordinate micaceous rocks, hibolites, &c. These come in contact with a smaller intrusive boss rtz-mica-diorite) in the Val Moja itself, and here the metamorphism e phyllite beds divides into two zones. In the outer the chief pro- of metamorphism is brown biotite, often formed around original s of ilmenite. Certain quartzitic rocks, though nearer to the contact, comparatively little affected. In the inner zone the dominant rock is rplish-grey schistose andalusite-mica-rock, showing complete meta- phism. It consists chiefly of muscovite, quartz, and biotite, with ttered crystals of andalusite, and in certain layers blue grains of corun-. The intrusive rock itself contains inclusions, some similar to the hbouring metamorphosed rocks, others different and especially rich in tierite [*cf.* preceding abstract].

he rocks in contact with the main tonalite-mass belong to a lower sion (gneiss-phyllite group) consisting of gneisses, mica-schists, &c., the metamorphism of these gives rise to some very remarkable types. minerals composing the altered rocks are especially cordierite, anda-te, biotite, muscovite, quartz, and felspar, including ordinary ortho-e, a peculiar fibrous orthoclase, and a little plagioclase; also, as ordinate or of local occurrence, garnet, tourmaline, sillimanite, spinel, undum, zircon, ilmenite, perhaps a little magnetite, and rarely pyrite. e cordierite includes an immense number of minute rounded or poly- al flakes of biotite: the fibrous orthoclase contains similar flakes, des little rounded granules of quartz: the inclusions in the andalusite especially quartz-granules and particles of iron-ore, rarely biotite-

flakes. The cordierite, fibrous orthoclase, and andalusite are not fou in the non-metamorphosed rocks, and their origin is clearly metamorph From their mode of association with these, the author infers the me morphic origin of the biotite interpositions, the corundum and spin most of the sillimanite, certain porphyritic crystals of plagioclase, and p bably the tourmaline. The other constituents seem to belong to original composition of the non-metamorphosed rocks, and indeed ordinary orthoclase and the muscovite disappear completely or alm completely with increasing metamorphism. The contact-aureole in gene is divisible into two zones, the inner 100 to 150 metres broad, the ou about 600 metres.

In the inner zone the rocks are mostly without any trace of gneissic schistose structure. The dominant type is a cordierite-rock consisting cordierite, to 60 or 70 per cent. or more, with biotite, andalusite, quar sillimanite, ilmenite, and zircon; in particular varieties plagioclase, v little orthoclase, garnet, spinel, and corundum; never muscovite. In intrusive rock itself occur inclusions of a rock also rich in cordierite, containing in addition abundant corundum and spinel, and showing ot peculiarities. These seem to be partially melted fragments of the nei bouring rocks. The tonalite enclosing them contains large garnets columnar crystals of biotite elongated parallel to the *c*-axis.

The rocks in the outer zone are almost always more or less banded. commonest types consist mostly of felspar, quartz, and mica (all apparen of metamorphic formation), with usually either cordierite or andalus Phenomena of metamorphism in many respects resembling those of Mo Aviolo have been described in the gneisses and mica-schists of Saxony R. Beck and F. Schalch (*Erläut. zur geol. spec. Karte Sachs., Sect Elster and Schönberg and Schwarzenberg*),

An analysis of one of the cordierite-contact-rocks gave the figu quoted in column III. above. The author considers that the metam phism has been accompanied by a certain amount of change in the t chemical composition of the rock [but his reasoning on this point appe scarcely convincing]. A full petrological examination of the rocks, trusive and metamorphic, follows, which cannot profitably be condense

A. E

Gabbros from the Transvaal.—P. Dahms has studied specimens gabbros from the Zwartkoppies, near Pretoria (*Neu. Jahrb.* 1890, B Bd. VII., p. 90). There are three types; those rich in plagioclase, th rich in pyroxene, and those containing quartz. From the first the aut

isolated and carefully analysed the plagioclase, diallage, and uralitic ablende.

	I.	II.	III.
SiO_2	49·96	53·53	52·73
Al_2O_3	32·33	3·12	4·70
Fe_2O_3	0·48	5·09	5·26
FeO	—	13·54	10·21
MgO	0·26	18·77	12·59
CaO	13·90	6·19	12·58
Na_2O	2·52	0·57	0·23
K_2O	1·20	0·20	0·06
H_2O	—	—	1·54
	100·65	101·01	99·90
Sp.gr. 2·720 to 2·723		3·31	

ie plagioclase (I.) corresponds to 1 molecule of albite, with 2·45 of hite; *i.e.* bytownite nearly approaching labradorite. The diallage is remarkable for its low percentage of lime and high percentage of oxide. The uralite (III.), compared with the diallage, from which derived, shows a considerable addition of lime with loss of magnesia errous oxide. Except in the last-named constituent the figures agree closely with analyses by Kudernatsch and Rammelsberg of uralite the Baltym-see. A. H.

ntribution to the Petrography of Japan. Dr. E. Weinschenk (*Neues buch f. Min.* Beilage Band VII. 1890, p. 133) describes the petro-ical character of a collection of Japanese rocks. The specimens ng from the volcanoes which have been active within historic times sted chiefly of hypersthene andesites, forming a group quite distinct the light-coloured garnetiferous rocks, together with a new type of ite rock which characterises the extinct volcanoes.

ie hypersthene-bearing rocks comprise hypersthene-augite-andesites hypersthene-hornblende-andesites. In structure they are partly aceous and partly compact. In a dark glassy groundmass containing porphyritic crystals of felspar and augite occur porphyritic crystals of ssy felspar, a dark pyroxene and hornblende. The glassy felspar is a basic plagioclase, having an angle of extinction of 30° in twins show-symmetrical extinction. Glass inclusions are plentiful, but no fluid sions were found. A second felspar, probably orthoclase, showing no lamellæ, is also present in small grains and broken fragments. Of

the pyroxene group there are present hypersthene, bronzite, and mon clinic augite. The hypersthene is of a deep brown colour with very inten pleochroism, a = b reddish yellow, b = a brownish red, c = c green. T bronzite is somewhat lighter. For closer examination the hypersthene w separated by Thoulet's solution, and the fragments treated with HF Fouqué's method in order to free them from adhering glass or felsp The crystals thus isolated were mostly about 1 mm. in length, and we elongated along the pinacoids with pyramidal termination and small tru cations by the prism. In section the refractive index was seen to be hig but the double refraction hardly greater than that of the felspar. Gla inclusions were very plentiful, so much so as to render an analysis impossib Two varieties of monoclinic augite giving oblique extinctions were prese One, exhibiting no pleochroism, was strongly doubly refractive, and show an optic axis surrounded by many rings; while the other, with stro pleochroism (b = brownish yellow to green, a and c green), had only we double refraction, and showed no rings round an optic axis. Intergrowt of rhombic and monoclinic augite are common in these rocks. Olivi occurs very sparingly in rounded grains. The groundmass consists of slightly glassy almost opaque brown base with lath-shaped plagiocla microlites, small augites, apatite, magnetite, and hypersthene.

Of the individual occurrences described by the author, the specimens fr Assamayama were black columnar hypersthene-andesites, and cordier bombs containing tridymite; from Nazuyama, lighter coloured hypersthe andesites and tuffs cemented by crystalline sulphur; from Harunaya and Ikao, hornblende- and hypersthene-augite-andesites, very similar the rocks described by Hague and Iddings from the Great Basin; fr Maryoshigan, augite-andesites of somewhat different type, containing v little hypersthene, with granular augite and lath-shaped felspars only the groundmass. The garnetiferous rocks from the extinct volcan comprised a sanidine-trachyte containing garnet and zircon, and a bioti andesite, both from the foot of Futagoyama; an andesitic pitchstone c taining a clear glassy plagioclase, biotite and garnet from Muzukishim and a light grey obsidian containing biotite and garnet from Himeshi

The new type of bronzite rock comes from the province of Sanuki, the neighbouring province of Kawachi. The rocks are grey, compa hornstone-like, consisting chiefly of long bronzite needles in a clear gla base containing magnetite. Comparison of a bulk analysis of the ro and an analysis of the bronzite isolated by HF showed that the bron made up less than 25 per cent. of the rock. The rocks bear the same lation to the andesites that the limburgites and augitites do to the basa and the author proposes to give them the name of "Sanukite." G. T. P

Spherulitic Rocks.—Dr. J. S. Hyland brings together a number of erulitic rocks from County Down, Ireland (*Scientific Proc. Roy. Dublin* . 1890, p. 420), under the name of "Spherulitic Quartz-Trachytes" 435). The spherulites resemble those of Rosenbusch's "Granores," but some cryptocrystalline matter is associated with the micromatite in the groundmass. The mean of two analyses of one of these ks, forming a dyke near Newcastle, Co. Down, gives (p. 428) SiO_2 70·07, $)_3$ 13·86, Fe_2O_3 1·89, FeO 0·52, P_2O_5 trace, CaO 1·44, MgO 0·70, K_2O), Na_2O 3·55. Loss on ignition, 1·07. Specific gravity, 2·589.

G. C.

. A. Wülfing: A Contribution to the knowledge of Cryoconite. Neues rbuch für Mineralogie, 1890. Beilage-Band 7, p. 152.

he author has made a careful microscopical and chemical examination me of the dust obtained from the inland ice of Greenland by Norskiöld, in the year 1883. The place is 1,073 metres above the sea-l, and 30 English miles from the nearest coast range, while the ice ld extends to a distance of nearly 50 miles away. After an interesting ement and criticism of the results obtained by previous investigators aterial similarly collected, Dr. Wülfing proceeds to describe the dust ch had been placed at his service.

is grey in colour, and in a state of very fine division: like that col-d in 1870, it has a peculiar smell suggestive of guano. Hydrochloric only extracts some of the ferriferous constituents; carbonates were recognised. The extract made by hot water leaves a little brownish fter evaporation; alcoholic and ether extracts, on evaporation, yield wnish yellow flakes of a wax-like body, soluble in caustic potash, and similar to the humus substances which may be extracted in the same from ordinary turf. When heated, the dust gives a very penetrating ll suggestive of the distillation products of tobacco. Minute particles of material of irregular form, visible with the microscope, are probably anic; a green alga was found to be present in small quantity.

ome of the dust was roughly separated by magnetic action; the unacted portion was mostly a pale pink garnet; hypersthene and zircon g also distinguishable. The attracted portion was partly black and ly brown; the former was inferred from its chemical behaviour to be gnetite; the latter was not decomposed by warm hydrochloric acid, and remarkable by reason of its spherical form; from 16 grams of dust, six well formed spherules, 0·09—0·17 mm. in diameter, were ined; one, when broken, was found to be of vitreous lustre and iso-

tropic; a second was opaque and brown throughout; a third gave fra
ments which were strongly birefractive; another was quickly dissolved
hydrofluoric acid.

Dr. Wülfing next describes an improved form of separater for use wi
heavy liquids, when the amount of material to be experimented upon
small; it consists of two arc-shaped tubes, joined so as to form a clos
circuit; a stop-cock is inserted at each of the places of junction. Aft
operating with this apparatus for a fortnight, 0·6 grams of lighter mater
had been separated from 1—1½ grams of the dust by means of a liquid
specific gravity 2·729. On quantitative analysis of some of this mater
the composition was found to approximate to that of a mixture of felsp
and quartz, the presence of each of which was otherwise definitely est
blished. Among the heavier particles were distinguished the followi
minerals:—biotite, hornblende, rhombic pyroxene, sillimanite, garn
zircon, magnetite, and probably also a monosymmetric pyroxene. D
Wülfing comes to the conclusion that the dust collected in 1883 consis
in great part of felspar, quartz, mica, and common hornblende; felsp
being predominant, and the quartz approaching 15 per cent., while t
mica and hornblende are subordinate. The other minerals are accesso
The organic substance amounts to about 5 per cent., and is nitrogenous

As regards the origin, the author accepts the view that the dust is
atmospheric sediment; the mode of occurrence, the great area ov
which it is found, the forms and sizes, both relative and absolute, of t
particles themselves, all point to this conclusion. He infers, with Lasau
and others, that the dust is, almost wholly at least, of terrestrial origi
and is the detritus of crystalline rocks—possibly situated on the East
West Coast of Greenland, or in the Scandinavian Peninsula, or even
North America; the organic material is in too large proportion to
ascribed to the technical processes of the Greenland factories. To t
spherules, however, Dr. Wülfing is inclined to ascribe an extra terrestr
origin, but almost entirely on negative grounds; as the quantity was t
small to allow of the mineralogical nature of the material being determine
and different kinds of spherules were present, positive evidence for an ext
terrestrial origin can scarcely be said to exist. L. F.

G. C. Hoffmann. On a peculiar form of Metallic Iron found on Joseph Island, Lake Huron, Ontario. Trans. Roy. Soc. Canada, 18
Vol. 8, Sec. 3, p. 39.

A thin deposit of limonite, coating what appeared to be fissure faces
some surface-specimens of quartzite, was found to contain numerous met

oking spherules, amounting to nearly 60 per cent. of its veight, di-nated through it. The metallic grains varied greatly in size, the st being about a third of a millimeter in diameter, and most of the far smaller; all were round and most of them approximately spherical; specific gravity was found to be 6·86. There was an insoluble ue (9·76 per cent.) after subjection to the action of hydrochloric acid; s non-metallic, and consisted of spherical, ovoid, &c., shaped grains, d with a yellowish-brown, humus-like substance; when broken they seen to have a concentric structure, apparently of a concretionary cter; after ignition they were snow-white and extremely hygroscopic; sis of a small quantity gave the following result:—

Silica	93·95
Alumina	1·13
Ferric Oxide	1·02
Lime	0·62
Magnesia	0·31
	97·03

e soluble portion of the metallic grains was found to have the follow-composition:—

Iron	97·79
Magnesia	0·57
Nickel	0·11
Cobalt	0·23
Copper	0·10
Sulphur	0·13
Phosphorus	1·07
	100·00

e disseminated grains thus consisted of nuclei of silica coated with us-like substance, which, in turn, was covered with a metallic layer, bly due to the reduction of an iron salt by organic matter. Four ured illustrations accompany the original paper. L. F.

INDEX TO MINERALOGICAL AND PETROGRAPHICAL PAPER 1888.

By H. A. Miers, M.A., and G. T. Prior, M.A.

Achroite.	A. Frenzel. Min. Mitth. ix. 399. *Ehrenfriedersdorf.*
Actinolite.	M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
Adinole.	F. Posepny. Min. Mitth. x. 175. *Przibram.*
Adularia.	A. Cathrein. Min. Mitth. x. 59. *Cryst.*
	A. Hamberg. Bih. Vet. Ak. Handl. xiii. (4). *Cryst.*
Aegyrine.	M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
Agate.	W. Abbott. Proc. Geol. Ass. x. 80.
	V. Ball. Q. J. Geol. Soc. xliv. 368. *Soudan.*
Alaskaite.	G. A. König. Zts. K. xiv. 254. *Chem.*
Albite.	A. Lacroix. Bull. Soc. Min. xi. 70. *Fouzac.*
	A. Sauer. Zts. Geol. Ges. Berl. xl. 146. *In Orthoclase.*
Allanite.	A. M. Lévy and A. Lacroix. Bull. Soc. Min. xi. 65. *Morla*
Allier.	L. de Launay. Bull. Soc. Géol. xvi. 84. *Porphyrites.*
Alum.	A. Mülheims. Zts. K. xiv. 223. *Opt.*
	A. Scacchi. N. J. 1888 (2), 127. *Vesuvius.*
Alunite.	R. MacIvor. Chem. News, lvii. 64. *N. S. Wales.*
Amalgam.	L. Darapsky. N. J. 1888 (1), 67. *Chili.*
Amarantite.	A. Frenzel. Min. Mitth. ix. 398. *New Min.*
	E. A. Wülfing. Min. Mitth. ix. 401. *Cryst.*
Amber.	A. Meyer. Nature, xxxix. 105.
Amblygonite.	M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
Amethyst.	C. S. Bement. Zts. K. xiv. 257. *Pennsylvania.*
	P. Kalugin. Verh. Russ. Min. Ges. xxiv. 253. *Urals, loc*
Amphibole.	P. Eremyev. Verh. Russ. Min. Ges. xxiv. 446. *Verkh'ise*
Amphibolite.	A. Fournier. Bull. Soc. Géol. xvi. 113. *Portevin.*
	A. Hettner and G. Linck. Zts. Geol. Ges. Berl. xl. 2 *Andes.*
	J. S. Hyland. Min. Mitth. x. 215. *Kilimanjaro.*
Analcite.	A. Scacchi. N. J. 1888 (2), 127. *Vesuvius.*
	L. Meschinelli and A. Balestra. Riv. Min. ii. 13. *Valle Lavarda.*
	A. Scacchi. Att. Ist. Nap. i. (5), 45. *Vesuvius.*
Anatase.	A. Frenzel. Min. Mitth. ix. 399. *Ehrenfriedersdorf.*
Andalusite.	C. Doelter. Min. Mitth. x. 80. *Art. Min. from.*
	A. Lacroix. Bull. Soc. Min. xi. 150. *With Sillimanite.*
	P. Eremyev. Verh. Russ. Min. Ges. xxiv. 451. *Kosibrod*

ALUSITE. M. de Onis. Ann. Soc. Esp. Hist. Nat. Act. xvii. 19. *Serrada.*

ES. A. Hettner and G. Linck. Zts. Geol. Ges. Berl. xl. 205. *Rocks.*

F. Rudolph. Min. Mitth. ix. 269. *Rocks.*

ESITE. A. Hettner and G. Linck. Zts. Geol. Ges. Berl. xl. 220. *Andes.*

Kloos. Verh. Nat. Ver. Karls. x. 30. *Krakatoa.*

C. Montemartini. Att. Acc. Tor. xxiii. 482. *Riviera di Nizza.*

F. Rudolph. Min. Mitth. ix. 276. *Andes.*

ESEY. J. Blake. Brit. Ass. Rep. 1887, 230. *Rocks.*

J. Blake. Q. J. Geol. Soc. xliv. 463. *Rocks.*

C. Callaway. Brit. Ass. Rep. 1887, 706. *Rocks.*

A. Harker. Geol. Mag. v. 267. *Rocks.*

LESITE. L. Bourgeois. Bull. Soc. Min. xi. 57. *Art;* and Bull. Soc. Chim. xlix. 28.

A. Frenzel. Min. Mitth. ix. 400. *Ehrenfriedersdorf.*

A. Scacchi. N. J. 1888 (2), 128. *Vesuvius.*

EDRITE. A. Mülheims. Zts. K. xiv. 228. *Opt.*

A. Scacchi. Att. Ist. Nap. i. (5), 9. *Vesuvius;* and N. J. 1888 (2), 128; and Att. Ac. Nap. (5), 9.

ETHITE. A. Scacchi. N. J. 1888 (2), 128. *Vesuvius;* and Att. Ist. Nap. i. (5) 33.

ICOPHYLLITE. M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*

J. J. H. Teall. Min. Mag. viii. 119. *Lizard.*

LGORITE. M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*

MONY. R. MacIvor. Chem. News, lvii. 64. *Queensland.*

CITE. H. Becquerel. Ann. Chim. Phys. xiv. 192. *Absorption.*

A. Frenzel. Min. Mitth. ix. 400. *Ehrenfriedersdorf.*

J. Joly. Phil. Mag. xxvi. 33. *Spec. Grav.*

G. Kunz. Am. J. Sc. xxxvi. 223. *Yonkers.*

A. Scacchi. Att. Ist. Nap. i. (5), 11. *Vesuvius;* and Att. Ac. Nap. i. (5), 11; and N. J. 1888 (2), 128.

ANITE-PORPHYRY. J. Früh. Denk. Schw. Ges. xxx. 50. *Switzerland.*

THITALITE. A. Scacchi. N. J. 1888 (2), 128. *Vesuvius;* and Att. Ist. Nap. 1 (5), 9.

PHYLLITE. E. Artini. Att. Ac. Linc. Rendic. iv. (1), 540. *Montecchio Maggiore.*

L. Meschinelli and A. Balestra. Riv. Min. ii, 14, 47. *Valle del Lavarda.*

GONITE. V. Cornish and P. Kendall. Geol. Mag. v. 66. *In fossils.*

P. Eremyev. Verh. Russ. Min. Ges. xxiv. 419. *Medzyana Ghora.*

H. Foullon. Jahrb. Geol. Reichs. xxxviii. 23. *Truskawiec.*

G. Kunz. Am. J. Sc. xxxvi. 224. *Arizona (pseud.).*

A. Mülheims. Zts. K. xiv. 229. *Opt.*

J. Niedzwiedzki. Verh. Geol. Reichs. 1888, 239. *Truskawiec.*

ARAGONITE. A. Scacchi. Att. Ist. Nap. i. (5), 13. *Vesuvius;* and 1888 (2), 128.

ARAGONITE-GROUP. J. Beckenkamp. Zts. K. xiv. 375. *Relations of.*

ARDENNITE. M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*

ARFVEDSONITE. M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*

ARIÈGE. de Lacoivier. Bull. Soc. Géol. xvi. 246. *Rocks.*

ARKOSE. Bigot. Bull. Soc. Norm. i. 12. *Val-de-Saire.*
Devilerdeau. Bull. Soc. Aut. i. 237. *Saône-et-Loire.*

ARSENIOPLEIITE. L. Igelström. Bull. Soc. Min. xi. 39. *New Min.;* and 1888 (2), 117.

ASBESTOS. F. Sandberger. N. J. 1888 (1), 208. *Vordorf.*

ASPHALT. P. Palmeri. Att. Ist. Nap. i. (10). *Salerno.*

ASTROPHYLLITE. M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*

ATACAMITE. A. Scacchi. Att. Ist. Nap. i. (5), 8. *Vesuvius;* and 1888 (2), 128.

ATELINE. A. Scacchi. Att. Ist. Nap. i. (5), 8. *Vesuvius;* and 1888 (2), 128.

AUERLITE. W. E. Hidden and J. B. Mackintosh. Zts. K. xv. 295. *Min.;* and Am. J. Sc. xxxvi. 461.

AUGITE. M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
A. Scacchi. Att. Ist. Nap. i. (5), 14. *Vesuvius;* and Ac. Nap. ii. (2), 104; and N. J. 1888 (2), 128.
J. Vogt. B. H. Ztg. xlvii. 167. *Art.*

AUGITE-ANDESITE. P. Franco. Rendic. Ac. Nap. xxvii. 464. *Vesuvius.*
C. Klein. N. J. Beil. Bd. vi. 32. *Bolsena;* and Mitth. Berl. 1888, 41.
A. Renard. Bull. Ac. Belg. xv. 625. *Cape Verde Is.*
O. Silvestri. Boll. Com. Geol. xix. 188. *Kilauea;* and Ac. Gioen, xx. 234.
A. Verri. Boll. Soc. Geol. vii. 97. *Central Italy.*

AUGITE-DIORITE. C. John. Jahrb. Geol. Reichs. xxxviii. 343. *Jablanica.*
Eck. Zts. Geol. Ges. Berl. xl. 182. *Schwarzwald.*

AUTUNITE. M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*

AXINITE. P. Eremyev. Verh. Russ. Min. Ges. xxiv. 446. *Verkh'is*

AZORITE. A. Ben-Saude. Bull. Soc. Min. xi. 201. *S. Miguel.*

BARYSILITE. A. Sjögren and C. Lundström. Öfv. Vet. Ak. Förh. xl *New Min.*

BARYTES. L. Bourgeois. Bull. Soc. Min. xi. 57. *Art.*
A. Cathrein. Min. Mitth. x. 52. *Cryst.*
J. Curie and G. B. M. Flamand. Ass. Fr. xvii. (1), *Alger.*
C. Düsing. Zts. K. xiv. 481. *Cryst.*
G. Flink. Bih. Vet. Ak. Handl. xiii. (7), 48. *Nordmark*
A. Frenzel. Min. Mitth. ix. 400. *Ehrenfriedersdorf.*
F. Gonnard. Bull. Soc. Min. xi. 269. *Cryst.*
F. Gonnard. C. R. cvii. 407. *Etching.*
O. Herschenz. Zts. Naturw. Halle, vii. 143. *Harz, Cry*

TES. A. Koch. Min. Mitth. ix. 416, x. 89. *Torda.*
G. Leube. Jahresh. Ver. Württ. xliv. 38. *Min.*
A. Leuze. Jahresh. Ver. Württ. xliv. 115. *Min.*
A. Mülheims. Zts. K. xiv. 227. *Opt.*
F. Pisani. Bull. Soc. Min. xi. 300. *Binnen.*
F. Sandberger. N. J. 1888 (1), 209. *Kreuzberg.*
W. Voigt. Pogg. Ann. xxxiv. 981. *Elasticity.*
K. Zimanyi. Ber. Ung. vi. 122. *Cryst.*

LT. G. Basile. Att. Ac. Gioen. xx. 29. *Etna.*
O. Beyer. Min. Mitth. x. 1. *Grossdehsa.*
J. S. Hyland. Min. Mitth. x. 236. *Kilimanjaro.*
H. Pohlig. Verh. Nat. Ver. Rheinl. 1888, Korr. Bl. 87. *Rhine.*
J. Iddings. Am. J. Sc. xxxvi. 208. *Quartz in.*
O. Silvestri. Att. Ac. Gioen. xx. 208. *Kilauea;* and Boll. Com. Geol. xix. 168.
J. Stock. Min. Mitth. ix. 429. *Löbauer Berg.*

NITE. J. S. Hyland. Min. Mitth. x. 248. *Kilimanjaro.*

ITE. Augé. Bull. Soc. Géol. xvi. 345. *Min.*
Collot. Ass. Fr. 1887 (1), 226. *Age of.*
P. Gourret and A. Gabriel. C. R. cvi. 1551. *Geol.*

MONTITE. A. Schmidt. Zts. K. xiv. 580. *Cryst. Sweden.*

ITE. T. M. Hughes. Camb. Phil. Soc. Proc. vi. 246.

NESIA. A. Scacchi. Att. Ist. Nap. i. (5), 11. *Vesuvius;* and N. J. 1888 (2), 129.

AL, BAY OF. V. Ball. Geol. Mag. v. 404. *Volcanoes.*

SSE ALPS. E. v. Fellenberg. Mitth. Nat. Ges. Bern. 1887, 89. *Granite and Gneiss.*

RANDITE. S. Penfield. Am. J. Sc. xxxvi. 52. *Colorado.*
C. Vrba. Zts. K. xv. 194. *Pisek.*
R. Scharizer. Zts. K. xiv. 33. *Pisek. Mon.*

L. F. Gonnard. Bull. Soc. Min. xi. 274. *Puy de Dôme.*
P. Kalugin. Verh. Russ. Min. Ges. xxiv. 253. *Urals, loc.*
W. Müller. Zts. K. xiv. 75. *Cryst.*
S. Penfield and E. Sperry. Am. J. Sc. xxxvi. 317. *Chem.*

LLONITE. E. S. Dana. Am. J. Sc. xxxvi. 290. *New Min.*
E. S. Dana and H. L. Wells. Zts. K. xv. 275. *New Min.*

TE. E. Cohen. N. J. 1888 (1), 165. *Pleochroism.*
C. Doelter. N. J. 1888 (2), 178. *Art.*
A. Scacchi. N. J. 1888 (2), 129. *Vesuvius.*
C. Doelter. Bull. Soc. Min. xi. 225. *Art.*

DE. G. Flink. Bih. Vet. Ak. Handl. xiii. (7), 15. *Nordmark.*
A. Scacchi. Att. Ist. Nap. 1 (5), 9. *Vesuvius;* and N. J. 1888 (2), 129.

TE. H. Foullon. Jahrb. Geol. Reichs. xxxviii. 3. *Hall.*

RRITE. A. Lacroix. C. R. cvi. 631.

NA. C. Klein. N. J. Beil. Bd. vi. 1. *Rocks;* and Mitth. Ak. Berl. 1888, 13.

ITE. W. Hankel. Abh. Sächs. Ges. xiv. 269. *Elect.*

Bosnia.	J. Straka. B. H. Ztg. xlvii. 151, 159. *Ores of.*
Braunite.	G. Flink. Bih. Vet. Ak. Handl. xiii. (7), 34. *Langban.*
Brazil.	J. Machado. Min. Mitth. ix. 318. *Rocks.*
Breislakite.	A. Scacchi. N. J. 1888 (2), 129. *Vesuvius.*
Breunerite.	H. Foullon. Jahrb. Geol. Reichs. xxxviii. 2. *Hall.*
Brochantite.	W. Hillebrand and H. Washington. Am. J. Sc. xxxv. 30 *Utah.*
Brucite.	H. Foullon. Jahrb. Geol. Reichs. xxxviii. 14. *Imst.*
Buckingite.	G. Linck. N. J. 1888 (1), 213. *Chili.*
Caernarvonshire.	J. Blake. Q. J. Geol. Soc. xliv. 271. *Rocks.*
	A. Harker. Q. J. Geol. Soc. xliv. 442. *Rocks.*
Calcite.	G. Cesàro. Bull. Soc. Min. xi. 51. *Rhisnes, Cryst.*
	V. Cornish and P. Kendall. Geol. Mag. v. 66. *In fossil*
	H. Foullon. Jahrb. Geol. Reichs. xxxviii. 23. *Truskaw*
	H. Goguel. Bull. Soc. Min. xi. 156. *Pic du Midi.*
	F. Gonnard. Bull. Soc. Min. xi. 34. *Pyrites, pseud. afte*
	C. Hastings. Am. J. Sc. xxxv. 60. *Opt.*
	C. Hintze. Zts. K. xiv. 74. *Riemendorf.*
	Huyssen. Zts. Geol. Ges. Berl. xl. 191. *Iceland Spar, l*
	R. Irvine and G. Young. Roy. Soc. Ed. xv. 316. *Solubil*
	J. Joly. Phil. Mag. xxvi. 33. *Spec. grav.*
	F. Katzer. Min. Mitth. ix. 401. *Bohemia.*
	J. Lemberg. Zts. Geol. Ges. Berl. xl. 357. *Microsc.*
	A. Leuze. Jahresh. Ver. Württ. xliv. 124, 125, 127. *Mi*
	C. Marangoni. Riv. Min. ii. 50. *Elect.*
	A. Mülheims. Zts. K. xiv. 224. *Opt.*
	J. Niedzwiedzki. Verh. Geol. Reichs. 1888, 239. *kawiec.*
	F. Sansoni. Att. Acc. Tor. xxiii. 198. *Cryst.*
	A. Scacchi. Att. Ist. Nap. i. (5), 11. *Vesuvius.*
	W. Spring. Bull. Soc. Chim. xlix. 3. *Acids on.*
	A. Scacchi. N. J. 1888 (2), 134. *Vesuvius.*
	H. Traube. N. J. 1888 (2), 252. *Ofen.*
Calomel.	H. Traube. Zts. K. xiv. 563. *Cryst.*
Campania.	A. Scacchi. Att. Ac. Nap. 2 (2). *Tuffs, &c.*
Campylite.	F. Gonnard. Bull. Soc. Min. xi. 35. *Pontgibaud.*
Cancrinite.	M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
Cape Verde.	A. Renard. Bull. Ac. Belg. xv. 621. *Rocks of.*
Cassiterite.	L. Bourgeois. Bull. Soc. Min. xi. 58. *Art.*
	A. Frenzel. Min. Mitth. ix. 400. *Ehrenfriedersdorf.*
	J. Garland. Rep. Corn. Pol. Soc. lvi. 54. *Galicia.*
Cassinite.	S. Penfield and E. Sperry. Am. J. Sc. xxxvi. 326. *Che*
Catapleiite.	M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
Celestine.	J. Beckenkamp. Zts. K. xiv. 72. *Kaiserstuhl.*
	L. Bourgeois. Bull. Soc. Min. xi. 57. *Art.*
	H. J. Johnston-Lavis. Min. Mag. viii. 28. *Cont. Sulph*
	A. Koch. Min. Mitth. ix. 416, x. 89. *Torda.*

...USTINE.	J. Niedzwiedzki. Verh. Geol. Reichs. 1888, 239. *Truskawiec.*
	K. Zimanyi. Ber. Ung. vi. 122. *Cryst.*
	L. Bourgeois. Bull. Soc. Chim. xlix. 28. *Art.*
	Schmidt. Arch. Sc. Phys. Nat. xx. 340. *Merligen.*
...TE.	J. Sebelien. Tidsk. Phys. Chem. ix. 97. *Chem.*
...SSITE.	E. Artini. Att. Ac. Linc. Mem. v. 605. *Cryst.*
	F. Gonnard. Bull. Soc. Min. xi. 31. *Pyromorphite, pseud. after.*
...CANTHITE. (?)	A. Scacchi. N. J. 1882 (2), 134. *Vesuvius.*
...CEDONY.	Vilanova. Brit. Ass. Rep. 1887, 699. *Uruguay.*
	V. Piera. Ass. Fr. 1887 (1), 228. *Enhydros.*
...COPHYLLITE.	W. Hillebrand and H. Washington. Am. J. Sc. xxxv. 303. *Utah.*
...TBITE.	H. Foullon. Jahrb. Geol. Reichs. xxxviii. 30. *In Opal.*
	F. Gonnard. Bull. Soc. Min. xi. 33. *Pseud.*
...NNEL ISLANDS.	A. Bigot. Bull. Soc. Géol., xvi. 412. *Rocks.*
...OLITE.	A. Scacchi. N. J. 1888 (2), 129. *Vesuvius.*
...RALUMINITE.	A. Scacchi. N. J. 1888 (2), 129. *Vesuvius.*
...RITE.	A. Frenzel. Min. Mitth. ix. 400. *Ehrenfriedersdorf.*
...RITOID-PHYLLITE.	A. Cathrein. Verh. Geol. Reichs. 1888, 159. *Gerlos.*
...ROCALCITE.	A. Scacchi. Att. Ist. Nap. i. (5), 7. *Vesuvius;* and N. J. 1888 (2), 129. *Vesuvius.*
...LOMAGNESITE.	A. Scacchi. N. J. 1888 (2), 130. *Vesuvius.*
...OSAPPHIRE.	H. Pohlig. Ber. Nied. Ges. Bonn. 1888, 44. *Siebengebirge.*
...ROTHIONITE.	A. Scacchi. N. J. 1888 (2), 130. *Vesuvius;* and Att. Ist Nap. i. (5), 10.
...OME-DIOPSIDE.	J. J. H. Teall. Min. Mag. viii. 116. *Lizard.*
...MITE.	R. Mac Ivor. Chem. News, lvii. 1. *Australia.*
	S. Meunier. C. R. cvii. 1153. *Art.*
...SOBERYL.	P. Hautefeuille and A. Perrey. C. R. cvi. 487. *Art.*
...SOTILE.	H. Goguel. Bull. Soc. Min. xi. 155. *Médoux.*
	J. Obalski. Boll. Com. Geol. xix. 65. *Canada.*
...ABAR.	Primat. Ann. Min. xiv. 95. *Monte Amiata.*
	H. Traube. Zts. K. xiv. 563. *Cryst.*
...DETITE.	A. Schmidt. Zts. K. xiv. 575. *Cryst.*
...TONITE.	L. Fletcher. Chem. News, lviii. 106, 119. *New Min.*
...OCHLORE.	P. Eremyev. Verh. Russ. Min. Ges. xxiv. 457. *Achmatovsk.*
	M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
...OCLASE.	W. Hillebrand and H. Washington. Am. J. Sc. xxxv. 303. *Utah.*
...TONITE.	M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
...RG.	F. Sandberger. N. J. 1888 (2), 247. *Min. of.*
...MANITE.	A. Mülheims. Zts. K. xiv. 230. *Opt.*
...MBIA.	W. Sievers. Zts. Ges. Erdk. Berl. xxiii. 1. *Rocks.*
...TONITE.	A. Scacchi. Att. Ist. Nap. 1, (5), 45. *Vesuvius.*
...LOMERATE.	A. Fournier. Bull. Soc. Géol. xvi. 118. *Arden.*
...APITE.	G. Linck. N. J. 1888 (1), 213. *Chili.*

COPIAPITE. G. Linck. Zts. K. xv. 14. *Copiapo.*

COPPER ORES. J. Collins. Q. J. Geol. Soc. xliv. 834. *Sudbury.*
B. Lotti. Boll. Com. Geol. xix. 295. *Apuan Alps.*
W. Sievers. Zts. Ges. Erdk. Berl. xxiii. 41. *Colombia.*

COQUIMBITE. G. Linck. Zts. K. xv. 5. *Copiapo.*
G. Linck. N. J. 1888 (1), 213. *Chili.*
A. Scacchi. N. J. 1888 (2), 130. *Vesuvius.*

CORDIERITE-GNEISS. E. Hovey. Am. J. Sc. xxxvi. 57. *Connecticut.*

CORUNDUM. H. Foullon. Verh. Geol. Reichs. 1888, 178. *Teplitz.*

COSSAITE. G. Piolte. Att. Acc. Tor. xxiii. 257. *Chem. &c.*

COTUNNITE. A. Scacchi. Att. Ist. Nap. i. (5), 7. *Vesuvius;* and N. J. 1888 (2), 130. *Vesuvius.*

COVELLITE. A. Scacchi. Att. Ist. Nap. i. (5), 9. *Vesuvius;* and N. J. 1888 (2), 130.

CROCIDOLITE. O. Schneider. Isis. Ber. 1887, 9.

CRUCITE. A. DesCloizeaux. Bull. Soc. Min. xi. 63. *Morbihan.*

CRYPHIOLITE. A. Scacchi. N. J. 1888 (2), 130. *Vesuvius;* and Att. Nap. i. (5), 14. *New Min.;* and Att. Ist. Nap. i. (5),

CRYPTOHALITE. A. Scacchi. Att. Ist. Nap. i. (5), 8. *Vesuvius;* and N. J. 1888 (2), 130.

CRYSTALLINE SCHISTS. Michel Lévy. Bull. Soc. Géol. xvi. 102. *Origin.*

CRYSTALLOGRAPHY. B. Hecht. N. J. 1888 (1), 75. *Math.*
T. Liebisch. N. J. Beil. Bd. vi. 105. *Math.*
L. Sohncke. Zts. K. xiv. 417, 426. *Math.*

CRYSTALS. H. Bäckström. Öfv. Vet. Ak. Förh. xlv. 533. *Thermoel*
H. Becquerel. Ann. Chim. Phys. xiv. 170. *Absorption.*
S. Finsterwalder. Ber. Ak. Münch. 1888, 257. *Elasticit*
P. Groth. Ber. Ak. Münch. 1888, 256. *Elasticity.*
C. Hintze. Jahresh. Schles. Ges. 1888, 115. *Opt.*
B. Kosmann. Jahresh. Schles. Ges. 1888, 120. *Phys.*
J. Krejci. Ber. Böhm. Ges. 1887, 401. *Opt.*
T. Liebisch. Nach. Ges. Gött. 1888, 197, 202. *Opt.*
Lord Rayleigh. Phil. Mag. xxvi. 241, 256. *Opt.*
C. Marangoni. Att. Ac. Linc. Rendic. iv. (1), 215. *Cla cation.*
C. Marangoni. Riv. Min. ii. 49. *Elect.*
J. Norrenberg. Verh. Nat. Ver. Rheinl. 1888, 1. *Opt.*
A. Schoenflies. Nachr. Ges. Gött. 1888, 483. *Math.*
L. Sohncke. Ber. Ak. Münch. 1888, 337. *Math.*
C. Soret. Arch. Sc. Phys. Nat. xx. 268. *Opt.*
F. Stenger. Pogg. Ann. xxxiv. 331. *Magnetism.*
G. Stokes. Phil. Mag. xxvi. 256. *Opt.*

CUPRITE. J. Joly. Phil. Mag. xxvi. 33. *Spec. grav.*
A. Scacchi. N. J. 1888 (2), 130. *Vesuvius;* and Att. Nap. i. (5), 5.

CUPROMAGNESITE. A. Scacchi. N. J. 1888 (2), 130. *Vesuvius.*

CUPROURANITE. F. Sandberger. N. J. 1888 (1), 205. *Wölsendorf.*

CUSPIDINE. A. Scacchi. Att. Ist. Nap. i. (5), 41. *Vesuvius;* and N. J. 1888 (2), 130.

ITE. G. Kunz. Am. J. Sc. xxxvi. 224. *N. Carolina.*
M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
OCHROME. A. Scacchi. N. J. 1888 (2), 130. *Vesuvius.*

E. A. Hettner and G. Linck. Zts. Geol. Ges. Berl. xl. 220. *Andes.*
F. Rudolph. Min. Mitth. ix. 307. *Andes.*
LITE. W. Brögger and H. Bäckström. Öfv. Vet. Ak. Förh. xlv.493 *New Min.*
LITE. O. Lüdecke. Zts. Naturw. Halle, vii. 235. *Mon.*
F. Sansoni. Att. Acc. Tor. xxiii. 198. *Cryst.*
NITE. J. Curie and G. B. M. Flamand. Ass. Fr. xvii. (i.) 182. *Algeria.*
STOID. B. H. Ztg. xlvii. 447. *In gold sand, Ecbatana.*
SSHIRE. A. Somervail. Geol. Mag. v. 46. *Rocks;* and Rep. Dev. Ass. xx. 215.
LSE. G. Greim. N. J. 1888 (1) 1. *Weilburg, metamorph.*
G. Greim. N. J. 1888 (1) 10. *Weilburg.*
A. Harker. Geol. Mag. v. 267. *Anglesey.*
A. Harker. Q. J. Geol. Soc. xliv. 448. *Sarn.*
A. Hettner and G. Linck. Zts. Geol. Ges. Berl. xl. 219. 230. *Andes.*
A. C. Lawson. Proc. Can. Inst. v. 173. *Rainy Lake.*
J. Machado. Min. Mitth. ix. 356. *Brazil.*
L. Ricciardi. Att. Soc. It. Mil. xxxi. 135. *Rossena.*
W. Sievers. Zts. Ges. Erdk. Berl. xxiii. 21. *Colombia.*
MAGE. M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
WND. C. Friedel. Bull. Soc. Min. xi. 64. *Australia.*
H. Lewis. Brit. Ass. Rep. 1887, 720. *Matrix of.*
C. Lewis. Proc. Ac. Phil. 1888, 81. *In Meteorite.*
DRE. A. Cathrein. Min. Mitth. x. 62. *Greiner.*
M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
DE. G. La Valle. Att. Ac. Linc. Mem. v. 389. *Cryst.*
TE. J. Früh. Denk. Schw. Ges. xxx. 49. *Switzerland.*
A. Harker. Q. J. Geol. Soc. xliv. 447. *Sarn.*
C. John. Jahrb. Geol. Reichs. xxxviii. 343. *Jablanica.*
F. Katzer. Jahrb. Geol. Reichs. xxxviii. 355. *Rican.*
J. Kemp. Am. J. Sc. xxxv. 331. *New York.*
J. Machado. Min. Mitth. ix. 350. *Brazil.*
W. Sievers. Zts. Ges. Erdk. Berl. xxiii. 23. *Colombia.*
G. Williams. Am. J. Sc. xxxv. 438. *Peekskill.*
ITE. A. Harker. Geol. Mag. v. 267. *Anglesey.*
A. Harker. Q. J. Geol. Soc. xliv. 460. *Sarn.*
A. Renard. Bull. Ac. Belg. xv. 623. *Cape Verde Is.*
A. Streng. N. J. 1888 (2), 181. *Londorf.*
OPHANE. A. Scacchi. N. J. 1888 (2), 131. *Vesuvius;* and Att. Ist. Nap. (5), 10.
ITE. F. Becke. Min. Mitth. x. 92. *Cryst.*

DOLOMITE. J. Lemberg. Zts. Geol. Ges. Berl. xl. 357. *Microsc.*
J. Niedzwiedzki. Verh. Geol. Reichs. 1888, 239. *Truskav*
A. Scacchi. N. J. 1888 (2), 131. *Vesuvius.*
W. Smeeth. Proc. Roy. Dub. Soc. vi. 272. *Howth.*

DUFRENITE. E. Kinch. Min. Mag. viii. 112. *Chem.*

DUMORTIERITE. F. Gonnard. Bull. Soc. Min. xi. 264. *Brignais.*
M. Lévy and A. Lacroix. C. R. cvi. 1546. *Vedestrand.*
M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*

EAST INDIES. H. Cretier. Jaarb. Mijn. xvii. 83. *Ores of, &c.*

ECLOGITE. Calderon. Ann. Soc. Esp. Hist. Nat. Act. xvii. 95. *Ped*

EDISONITE. G. Williams. Am. J. Sc. xxxvi. 272. *New Min.*

EGYPT. O. Schneider. Isis Abh. 1887, 14. *Granite.*

EHRENFRIEDERSDORF. A. Frenzel. Min. Mitth. ix. 400. *Min. of.*

ELÆOLITE-SYENITE. A. Lacroix. C. R. cvi. 1031. *Pouzac.*

ELEONORITE. G. A. Koenig. Proc. Ac. Phil. 1888, 139. *Sevier Co.*

EMERALD. P. Hautefeuille and A. Perrey. C. R. cvi. 1800. *Art.*

EMMONITE. A. Cathrein. Zts. K. xiv. 366. *Brixlegg.*

ENGADINE. v. Gümbel. Jahresb. Nat. Ges. Graub. xxxi. 3. *Rocks.*

ENSTATITE-PORPHYRITE. Calderon. Ann. Soc. Esp. Hist. Nat. Act. xvii. 109, *Cerro de la Plata.*

EPIDOSITE. C. A. Raisin. Geol. Mag. v. 416.
F. Rutley. Q. J. Geol. Soc. xliv. 740. *Origin of.*

EPIDOTE. H. Becquerel. Ann. Chim. Phys. xiv. 233. *Absorption.*
P. Eremyev. Verh. Russ. Min. Ges. xxiv. 457. *Achmat*
J. Gränzer. Min. Mitth. ix. 361. *Cryst.*
W. Ramsay. Bih. Vet. Ak. Handl. xiii. (1). *Opt.*
F. Sandberger. N. J. 1888 (1), 208. *Vordorf.*

EPSOMITE. R. Mac Ivor. Chem. News, lvii. 114. *New Zealand.*
A. Scacchi. N. J. 1888 (2), 131. *Vesuvius.*

ERINITE. W. Hillebrand and H. Washington. Am. J. Sc. xxxv. *Utalt.*

ERIOCALCITE. A. Scacchi. Att. Ist. Nap. i. (5), 8. *Vesuvius;* an N. J. 1888 (2), 131.

ERUBESCITE. F. Katzer. Min. Mitth. ix. 401. *Bohemia.*

ERYTHROSIDERITE. A. Scacchi. Att. Ist. Nap. i. (5), 8. *Vesuvius;* and N. J. 1888 (2), 131.

ETNA. G. Basile. Att. Ac. Gioen. xx. 29. *Bombs of.*

EUCHLORITE. A. Scacchi. Att. Ist. Nap. i. (5), 10. *Vesuvius;* and N. J. 1888 (2), 131.

EUCLASE. P. Eremyev. Verh. Russ. Min. Ges. xxiv. 244. *Cryst*

EUCOLITE. M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*

EUGANEAN MTS. L. Ricciardi. Att. Soc. It. Mil. xxxi. 195. *Rocks of.*

EUXENITE. G. Krüss. Ber. Chem. Ges. Berl. xxi. 131. *Chem.*
J. Sebelien. Tidsk. Phys. Chem. ix. 97. *Chem.*

FACELLITE. A. Scacchi. Att. Ist. Nap. i. (5), 42. *Vesuvius.*
E. Scacchi. Rendic. Ac. Nap. xxvii. 486. *New Min*

EITE. G. Kinahan. Proc. Roy. Dub. Soc. vi. 169. *Irish.*
F. Rutley. Q. J. Geol. Soc. xliv. 740. *Perlitic.*

HUSONITE. J. Sebelien. Tidsk. Phys. Chem. ix. 97. *Chem.*

EI TELGEBIRGE. P. Michael. N. J. 1888 (1), 32. *Rocks of.*

IT. J. Judd. Proc. Geol. Ass. x. 217. *Decomposition of.*

DR. G. Flink. Bih. Vet. Ak. Handl. xiii. (7), 46. *Nordmark.*
A. Frenzel. Min. Mitth. ix. 400. *Ehrenfriedersdorf.*
F. Gonnard. Bull. Soc. Min. xi. 157. *Pontgibaud;* and C. R. cvi. 558.
H. Hoefer. Min. Mitth. x. 158. *Rabenstein.*
Huber. Ber. Ges. Nat. Fr. Berl. 1888, 74. *Senlis.*
C. Hintze. Zts. K. xiv. 74. *Cryst.*
C. Marangoni. Riv. Min. ii. 50. *Elect.*
A. Mülheims. Zts. K. xiv. 233. *Opt.*
A. Scacchi. N. J. 1888 (2), 132. *Vesuvius;* and Att. Ist Nap. 1 (5), 8.
A. Scacchi. Rendic. Ac. Nap. xxvii. 130. *Campania.*
A. N. Tate. Proc. Liv. Geol. Soc. v. 384. *Colour.*
W. Voigt. Nachr. Ges. Gött. 1888, 299. *Elasticity.*

HESLEBENITE. L. Eakins. Am. J. Sc. xxxvi. 451. *Colorado.*

ERO. J. Früh. Denk. Schw. Ges. xxx. 51. *Switzerland.*
A. Harker. Q. J. Geol. Soc. xliv. 447. *Sarn.*
C. John. Jahrb. Geol. Reichs. xxxviii. 343. *Jablanica.*
G. Williams. Am. J. Sc. xxxv. 438. *Peekskill.*

AN. P. de Rouville and A. Delage. C. R. cvii. 665. *Porphyrite.*

GLINITE. A. Lacroix. Bull. Soc. Min. xi. 68. *Mourne Mts.*
W. Peterson. Ofv. Vet. Ak. Förh. xlv. 179. *Chem.*

ENA. A. Brunlechner. Jahrb. Geol. Reichs. xxxviii. 311. *Mies (sphärenerz).*
H. Foullon. Jahrb. Geol. Reichs. xxxviii. 1. *Hall.*
K. Ghrivnak. Verh. Russ. Min. Ges. xxiv. 450. *Kirghiz Steppe.*
F. Gonnard. Bull. Soc. Min. xi. 31, 32. *Pyromorphite, pseud. after.*
J. Joly. Phil. Mag. xxvi. 33. *Spec. grav.*
A. Scacchi. Att. Ist. Nap. i. (5), 8. *Vesuvius;* and N. J. 1888 (2), 129.
H. Traube. N. J. 1888 (2), 253. *Bottino.*

NET. A. Cathrein. Min. Mitth. x. 55. *Cryst.*
C. Doelter. Min. Mitth. x. 74. *Art. Min. from.*
P. Eremyev. Verh. Russ. Min. Ges. xxiv. 446. *Verkh'isetsk.*
P. Eremyev. Verh. Russ. Min. Ges. xxiv. 438. *Blaghodat Ghora.*
A. Scacchi. Att. Ist. Nap. i. (5), 43. *Vesuvius;* and N. J. 1888 (2), 132.

ILENITE. M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*

IS. A. Foote. Nature, xxxvii. 68. *United States.*

GENGENBACH. Platz. Verh. Nat. Ver. Karls. x. 4. *Min. of.*
GENTHITE. F. Clarke. Am. J. Sc. xxxv. 484. *Oregon.*
P. Walker. Am. Chem. J. x. 44. *Chem. N. Carolina.*
GERLOS. A. Cathrein. Verh. Geol. Reichs. 1888, 159. *Chlorite phyllite.*
GLAUBERITE. A. M. Konshin. Verh. Russ. Min. Ges xxiv. 23. *Tran caspia.*
A. Scacchi. N. J. 1888 (2), 132. *Vesuvius.*
GLAUCOPHANE. J. Blake. Geol. Mag. v. 125. *Anglesey.*
GLAUCOPHANE-ROCKS. H. Foullon. Jahrb. Geol. Reichs. xxxviii. 31.
GMELINITE. G. B. Negri. Riv. Min. ii. 3. *Cryst.*
GNEISS. E. Danzig. Mitth. Min. Inst. Kiel, i. 33. *Saxony.*
E. v. Fellenberg. Mitth. Nat. Ges. Bern. 1887, 89. *Bern Alps.*
A. Fournier. Bull. Soc. Géol. xvi. 113. *Poitevin.*
H. Fox and J. J. H. Teall. Q. J. Geol. Soc. xliv. 309. *Lizard.*
J. Früh. Denk. Schw. Ges. xxx. 41. *Switzerland.*
A. Hettner and G. Linck. Zts. Geol. Ges. Berl. xl. 215, 22 *Andes.*
J. S. Hyland. Min. Mitth. x. 214. *Kilimanjaro.*
Le Verrier. C. R. cvii. 699. *Structure.*
J. Machado. Min. Mitth. ix. 219. *Brazil.*
C. A. Raisin. Geol. Mag. v. 416. *Rocks.*
W. Sievers. Zts. Ges. Erdk. Berl. xxiii. 12. *Colombia.*
J. J. H. Teall. Brit. Ass. Rep. 1887, 707. *Banded.*
GOLD. P. Holland. Chem. News, lvii. 76. *Transvaal, Chem.*
J. Joly. Phil. Mag. xxvi. 33. *Spec. Grav.*
R. Mac Ivor. Chem. News, lvii. 64. *N. S. Wales.*
T. Readwin. Proc. Geol. Ass. x. 339. *Wales.*
W. Topley. Brit. Ass. Rep. 1887, 510. *Distribution.*
GÖTHITE. G. Rousseau and J. Bernheim. C. R. cvi. 1530. *Art.*
GRAMMATITE. F. Sandberger. N. J. 1888 (i.), 204. *Alexandersbad.*
GRANITE. O. Beyer. Min. Mitth. x. 1. *Grossdehsa.*
A. Bialoveski. Nature, xxxix. 30. *Altai.*
E. Danzig. Mitth. Min. Inst. Kiel, i. 33. *Saxony.*
E. v. Fellenberg. Arch. Sc. Phys. Nat. xx. 335. *Habkeren*
E. v. Fellenberg. Mitth. Nat. Ges. Bern. 1887, 89. *B nese Alps.*
J. Früh. Denk. Schw. Ges. xxx. 43. *Switzerland.*
A. Harker. Q. J. Geol. Soc. xliv. 444. *Sarn.*
F. Hatch. Q. J. Geol. Soc. xliv. 548. *Spheroidal.*
A. Hettner and G. Linck. Zts. Geol. Ges. Berl. xl. 218, 2 *Andes.*
F. Katzer. Jahrb. Geol. Reichs. xxxviii. 355. *Rican.*
G. Kinahan. Proc. Roy. Dub. Soc. vi. 169. *Irish.*
D. Lovisato. Att. Ac. Linc. Rendic. iv. (1), 355. *Fonni.*
C. A. McMahon. Geol. Mag. v. 61. *Himalayas.*

:INITE. R. Pohlmann. N. J. 1888 (2), 87. *In Kersantite.*
F. Sandberger. Ber. Ak. Münch. 1888, 423. *Lepidolite.*
O. Schneider. Isis Abh. 1887, 14. *Egypt.*
W. Sievers. Zts. Ges. Erdk. Berl. xxiii. 1. *Colombia.*
W. Sollas. Proc. Roy. Dub. Soc. vi. 255, 263. *Ireland.*
P. W. Stuart-Menteath. Bull. Soc. Géol. xvi. 46. *Pyrénées.*
W. Ussher. Rep. Dev. Ass. xx. 141. *Dartmoor.*

'INITE PORPHYRY. C. Chelius. N. J. 1888 (2), 78. *Odenwald.*
W. Sievers. Zts. Ges. Erdk. Berl. xxiii. 10. *Colombia.*

'INULINE. A. Scacchi. Att. Ist. Nap. i. (5), 5. *Vesuvius;* and N. J. 1882 (2), 132.

'NULITE. C. Barrois. C. R. cvi. 428. *Morbihan.*
E. Danzig. Mitth. Min. Inst. Kiel, i. 33. *Saxony.*
K. de Kroustschoff. Bull. Soc. Min. xi. 173. *Foni.*
A. Michel Lévy. Bull. Soc. Géol. xvi. 227. *Lyon.*

'PHITE. G. Crewdson. Geol. Mag. v. 287. *Kendal.*
W. Collins. Chem. News, lvii. 36. *Chem.*
A. Scacchi. Att. Ist. Nap. i. (5), 3. *Vesuvius;* and N. J. 1888 (2), 132.

'PHITOID. F. Sandberger. N. J. 1888 (1), 202. *Wunsiedel.*

'SSDEHSA. O. Beyer. Min. Mitth. x. 1. *Basalt.*

'RINITE. A. Scacchi. Att. Ist. Nap. i. (5), 45. *Vesuvius;* and N. J. 1888 (2), 132.

'ROFIAN. H. Foullon. Jahrb. Geol. Reichs. xxxviii. 15.

'UM. Baret. Bull. Soc. Min. xi. 295. *Batz.*
H. Dufet. Bull. Soc. Min. xi. 123. *Opt.*
H. Foullon. Jahrb. Geol. Reichs. xxxviii. 25. *Truskawiec.*
J. Goodchild. Proc. Geol. Ass. x. 425. *Min.*
A. Kenngott. N. J. 1888 (1), 212. *On coke.*
A. M. Konshin. Verh. Russ. Min. Ges. xxiv. 23. *Transcaspia.*
A. Leuze. Jahresh. Ver. Württ. 1888, 125. *Min.*
C. Marangoni. Att. Ac. Linc. Rendic. iv. (1), 126. *Elect.* and Riv. Min. ii. 51. *Elect.*
A. Mülheims. Zts. K. xiv. 230. *Opt.*
J. Niedzwiedzki. Verh. Geol. Reichs. 1888, 239. *Truskawiec.*
A. Pomel. C. R. cvii. 53. *Algeria.*
A. Scacchi. Att. Ist. Nap. i. (5), 9. *Vesuvius;* and Att. Ac. Nap. i. (5), 9; and N. J. 1888 (2), 132.
G. Spezia. Att. Acc. Tor. xxiii. 25. *Val Cherasca.*

'ATITE. H. Bäckström. Öfv. Vet. Ak. Förh. xlv. 553. *Thermoel.*
G. Flink. Bih. Vet. Ak. Handl. xiii. (7), 23. *Langban, &c.*
A. Scacchi. Att. Ac. Nap. i. (1), 6. *Vesuvius;* and Att. Ist. Nap. i. (5), 3; and N. J. 1888 (2), 133.
G. Struever. Att. Ac. Linc. Rendic. iv. (1), 347. *Cryst.*

'INGERITE. A. DesCloizeaux. Bull. Soc. Min. xi. 195. *Opt.;* and C. R. cvi. 1218.

HALITE. A. Scacchi. N. J. 1882 (2), 133. *Vesuvius.*
HALL. H. Foullon. Jahrb. Geol. Reichs. xxxviii. 1. *Min. of.*
HALOTRICHITE. A. Konshin. Verh. Russ. Min. Ges. xxiv. 23. *Transcasp*
G. Linck. N. J. 1888 (1), 213. *Chili;* and Zts. K. xv.
A. Pichler. Verh. Geol. Reichs. 1888, 298. *Sulferbruck.*
HAUSMANNITE. G. Flink. Bih. Vet. Ak. Handl. xiii. (7), 40. *Langb*
Nordmark.
A. Scacchi. Att. Ist. Nap. i. (5), 5. *Vesuvius;* and N. J. 1888 (2), 133.
HAUYNE. A. Scacchi. N. J. 1888 (2), 133. *Vesuvius;* and Att. Nap. i. (5), 41.
HELIOPHYLLITE. G. Flink. Öfv. Vet. Ak. Förh. xlv. 574. *New Min.*
HELVITE. P. Eremyev. Verh. Russ. Min. Ges. xxiv. 426. *Ilmet*
birge.
M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
HERDERITE. A. Frenzel. Min. Mitth. ix. 400. *Ehrenfriedersdorf*
HEULANDITE. E. Artini. Att. Ac. Linc. Rendic. iv. (1), 536. *Montec*
Maggiore.
HIMALAYA. C. MacMahon. Geol. Mag. v. 61. *Granite.*
HOHMANNITE. A. Frenzel. Min. Mitth. ix. 397, 423. *New Min.*
E. A. Wülfing. Min. Mitth. ix. 401. *Cryst.*
HOMILITE. W. Petersson. Öfv. Vet. Ak. Förh. xlv. 179. *Chem*
HORNBLENDE. C. Doelter. Min. Mitth. x. 68. *Art. Mica from.*
G. Flink. Bih. Vet. Ak. Handl. xiii. (7), 74. *Nordmark.*
A. Harker. Min. Mag. viii. 30. *In Rocks.*
M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
A. Scacchi. N. J. 1888 (2), 127. *Vesuvius;* and Att. Ist. Nap. i. (5), 17.
J. J. H. Teall. Min. Mag. viii. 117. *Lizard.*
HORNBLENDE-ANDESITE. A. Renard. Bull. Ac. Belg. xv. 627. *Cape Verde Is.*
HORNBLENDE-BIOTITE ROCK. F. Hutton. Q. J. Geol. Soc. xliv. 745. *New Zeal*
HORNBLENDE-DIABASE. A. Harker. Q. J. Geol. Soc. xliv. 450. *Sarn.*
HORNBLENDE-PICRITE. A. Harker. Q. J. Geol. Soc. xliv. 454. *Sarn.*
HORSFORDITE. A. Laist and T. Norton. Am. Chem. J. x. 60. *New Min*
HUMITE. M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
A. Scacchi. Att. Ist. Nap. i. (5), 19. *Vesuvius;* and N. J. 1888 (2), 133.
HYALITE. H. Hoefer. Min. Mitth. x. 158. *Carlsbad.*
HYALOPHANE. L. Igelström. Bull. Soc. Min. xi. 263. *Sjögrufvan.*
v. Cassinite.
HYDRARGILLITE. M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
HYDRO-CERUSSITE. L. Bourgeois. Bull. Soc. Chim. l. 83. *Chem. Art.;* Bull. Soc. Min. xi. 221; and C. R. cvi. 1641.
HYDROCYANITE. A. Scacchi. Att. Ist. Nap. i. (5), 9. *Vesuvius;* and N. J. 1888 (2), 133.
HYDRODOLOMITE. A. Scacchi. Att. Ist. Nap. i. (5), 13. *Vesuvius;* and N. J. 1888 (2), 133.
HYDROGIOBERTITE. A. Scacchi. N. J. 1888 (2), 134. *Vesuvius.*

ERSTHENE. M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
ERSTHENITE. F. Sandberger. N. J. 1888 (2), 247. *Coburg.*
ERSTHENE-PORPHYRITE. K. Lossen. Zts. Geol. Ges. Berl. xl. 200. *Elbingerode.*
OSTILBITE. L. Darapsky. N. J. 1888 (1), 65. *Chili.*

C. A. Hering. Zts. K. xiv. 250. *Cryst.*
RASE. C. Doelter. Min. Mitth. x. 85. *Art. Min. from.*
Platz. Verh. Nat. Ver. Karls. x. 64. *Gengenbach.*
A. Scacchi. N. J. 1888 (2), 134. *Vesuvius;* and Att. Ist. Nap. i. (5), 42.
J. Strüver. N. J. 1888 (2), 35. *Ala.*
NITE. P. Eremyev. Verh. Russ. Min. Ges. xxiv. 457. *Achmatovsk.*
J. McCaleb. Am. Chem. J. x. 36. *In soils.*
AND. G. Kinahan. Proc. Roy. Dub. Soc. vi. 169. *Rocks of.*
G. Kinahan. Proc. Roy. Dub. Soc. vi. 343. *Rocks and Minerals.*
ORES. J. T. B. Ives. Proc. Can. Inst. v. 185. *Ontario.*
B. Lotti. Bull. Soc. Géol. xvi. 406. *Rocks.*
(CENTRAL). A. Verri. Bol. Soc. Geol. vii. 49. *Volcanic Rocks.*

NICA. C. John. Jahrb. Geol. Reichs. xxxviii. 343. *Rocks.*
SITE. G. Flink. Bih. Vet. Ak. Handl. xiii. (7), 40. *Nordmark.*
F. Berwerth. Ann. Mus. Wien. iii. 79. *Steiermark.*
W. Kellner. B. H. Ztg. xlvii. 59, 79. *Min. of.*

EN. A. Dick. Min. Mag. viii. 15. *Cryst.*
ANTITE. C. Chelius. N. J. 1888 (2), 71. *Spessart.*
R. Pohlmann. N. J. 1888 (2), 87. *Lehesten.*
EA. O. Silvestri. Att. Ac. Gioen, xx. 189. *Lavas of;* and Boll. Com. Geol. xix. 128, 168.
ANJARO. F. Hatch. Geol. Mag. v. 257. *Peridotite.*
J. S. Hyland. Min. Mitth. x. 202. *Rocks.*
OTHITE. M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
HUBEITE. R. Prendel. Zts. K. xv. 81. *Phys.*
LTOA. J. W. Judd. Geol. Mag. v. 1. *Lava of.*
Kloos. Verh. Nat. Ver. Karls. x. 30. *Ashes of.*
TONITE. K. Oebbeke. Ber. Phys. Soc. Erl. 1888, 41.
TE. M. de Onis. Ann. Soc. Esp. Hist. Nat. Act. xvii. 19. *Serrada.*

ER SEE. H. Pohlig. Ber. Nied. Ges. Bonn. 1888, 51, 60. *Rocks.*
DORITE. K. v. Chrustschoff. Min. Mitth. ix. 470. *Volhynia.*
J. J. H. Teall. Min. Mag. viii. 117. *Lizard.*
VIEW. G. vom Rath. Ber. Nied. Ges. Bonn. 1888, 14. *Rocks.*
ANITE. G. Flink. Bih. Vet. Ak. Handl. xiii. (7), 91. *Langban.*
L. Igelström. Bull. Soc. Min. xi. 297. *Sjögrufvan.*
ORDITE. F. A. Genth. Zts. K. xiv. 255. *New Min.*
LAZULI. A. Scacchi. N. J. 1888 (2), 134. *Vesuvius.*

LAVA.	J. W. Judd. Brit. Ass. Rep. 1887, 711. *Krakatoa.*
	J. W. Judd. Geol. Mag. v. 1. *Krakatoa.*
	O. Silvestri. Boll. Com. Geol. xix. 128. *Kilauea.*
LAVENITE.	A. Lacroix. C. R. cvi. 1032. *Pouzac.*
LEAD.	A. Hamberg. Öfv. Vet. Ak. Förh. xlv. 483. *Persberg.*
LEAD ORE.	R. Scharizer. Verh. Geol. Reichs. 1888, 173. *Persia.*
LEPIDOLITE.	F. Sandberger. Ber. Ak. München. 1888, 423. *Granite.*
	C. Doelter. Bull. Soc. Min. xi. 229. *Art.*
LEUCITE.	A. Scacchi. Att. Ist. Nap. i. (5), 28. *Vesuvius;* and N. J. 1888 (2), 134.
LEUCITE BASANITE.	C. Klein. N. J. Beil. Bd. vi. 13. *Bolsena;* and Mitth. Berl. 1888, 24.
LEUCITE TEPHRITE.	C. Klein. Mitth. Ak. Berl. 1888, 24. *Bolsener See;* and N Beil. Bd. vi. 13.
LEUCITIC LAVAS.	A. Verri. Boll. Soc. Geol. vii. 84. *Central Italy.*
LEUCITITE.	C. Klein. Mitth. Ak. Berl. 1888, 24. *Bolsener See.*
LEUCITOPHYRE.	L. Bucca. Boll. Com. Geol. xix. 57. *Viterbo.*
	C. Klein. Mitth. Ak. Berl. 1888, 39. *Bolsener See;* N. J. Beil. Bd. vi. 13.
LEUCOPHANE.	H. Becquerel. Ann. Chim. Phys. xiv. 230. *Absorption.*
	M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
LIMBURGITE.	J. S. Hyland. Min. Mitth. x. 220. *Kilimanjaro.*
	E. Möller. N. J. 1888 (1), 106. *Ulmenstein.*
	A. Renard. Bull. Ac. Belg. xv. 632. *Cape Verde Is.*
LIME.	A. Scacchi. N. J. 1888 (2), 134. *Vesuvius.*
LIMONITE.	H. Hoefer. Min. Mitth. x. 155. *Elba.*
	A. Scacchi. Att. Ist. Nap. i. (5), 14. *Vesuvius;* and N. J. 1888 (2), 135.
	G. Tenore. Att. Ist. Nap. i. (6). *Sora.*
LINARITE.	A. Scacchi. N. J. 1888 (2), 135. *Vesuvius.*
LINSBERG.	E. Möller. N. J. 1888 (1), 81. *Rocks.*
LITHIDIONITE.	A. Scacchi. N. J. 1888 (2), 135. *Vesuvius;* and Att. Ist. Nap. i. (5), 47.
LITHIOPHORITE.	F. Sandberger. N. J. 1888, (1), 208. *Vordorf.*
LIZARD.	H. Fox and A. Somervail. Geol. Mag. v. 74. *Rocks.*
	A. Somervail. Geol. Mag. v. 553. *Rocks.*
	H. Fox. Rep. Plym. Inst. x. 113. *Rocks.*
	H. Fox and J. Teall. Q. J. Geol. Soc. xliv. 309. *R near.*
	H. Fox and A. Somervail. Brit. Ass. Rep. 1887, 708. *R*
	E. Wunsch. J. Roy. Inst. Corn. ix. 353. *Rocks.*
LLEYN.	J. Elsden. Geol. Mag. v. 303. *Rocks.*
LÖBAUER BERG.	J. Stock. Min. Mitth. ix. 429. *Basalts.*
LONCHIDITE.	F. Sandberger. N. J. 1888 (1), 205. *Redwitz.*
LOESS.	F. Sacco. Bull. Soc. Géol. xvi. 229. *Piémont.*
LUDWIGITE.	E. Mallard. Bull. Soc. Min. xi. 310. *Art.*
LYON.	A. Michel Lévy. Bull Soc. Géol. xvi. 216. *Rocks.*
MADAGASCAR.	E. Cortese. Boll. Com. Geol. xix. 103. *Rocks.*

MAGNESIOFERRITE. A. Scacchi. N. J. 1888 (2), 135. *Vesuvius;* and Att. Ist. Nap. i. 4.

MAGNETITE. L. Brugnatelli. Zts. K. xiv. 237. *Cryst.*
A. Cathrein. Min. Mitth. x. 53. *Cryst.*
H. Pohlig. Ber. Nied. Ges. Bonn. 1888, 63. *Min.*
A. Scacchi. Att. Ist. Nap. i. (5), 4. *Vesuvius.*
A. Andreas and W. König. Abh. Senck. Ges. xv. (2). *Frankenstein.*
P. Eremyev. Verh. Russ. Min. Ges. xxiv. 457. *Achmatovsk.*
G. Flink. Bih. Vet. Ak. Handl. xiii. (7), 38. *Nordmark.*
J. Joly. Phil. Mag. xxvi. 33. *Spec. Grav.*
A. Scacchi. N. J. 1888 (2), 135. *Vesuvius.*

MALE. C. S. Bement. Zts. K. xiv. 256. *Min. of.*

MALACHITE. C. S. Bement. Zts. K. xiv. 257. *Arizona.*

MALACOLITE. J. J. H. Teall. Min. Mag. viii. 118. *Lizard.*

MALVERN. C. Callaway. Brit. Ass. Rep. 1887, 706. *Rocks.*

MANCHESTER. T. Mellard Reade and J. W. Judd. Proc. Liv. Geol. Soc. 377. *Porphyrite.*

MANGANESE ORES. Fabricius. Ber. Nied. Ges. Bonn. 1888, 63.
H. Pohlig. Ber. Nied. Ges. Bonn. 1888, 24.
F. Dunnington. Am. J. Sc. xxxvi. 175. *Origin of.*

MANGANESE SULPHATE? A. Scacchi. N. J. 1888 (2), 136. *Vesuvius.*

MANGANITE. A. Gorgeu. C. R. cvi. 1101. *Pyrolusite after;* and Bull. Soc. Min. xi. 196. *Alteration of.*

MANGANOPHYLLITE. G. Flink. Bih. Vet. Ak. Handl. xiii. (7), 70. *Langban.*

MANHATTANITE. G. Williams. Am. J. Sc. xxxvi. 263. *Peekskill.*

MARGARITE. A. Leuze. Jahresh. Verh. Württ. 1888, 129. *Pseud.*

MARIUPOLITE. P. Eremyev. Verh. Russ. Min. Ges. xxiv. 426. *Ilmengebirge.*

MARKOPILITE. G. A. Koenig. Proc. Ac. Phil. 1888, 192. *New Min.*

MARTITE. A. Scacchi. Att. Ist. Nap. i. (5), 38. *Vesuvius;* and N. J. 1888 (2), 136.

MASONOPHLOGITE. F. Pisani. Bull. Soc. Min. xi. 298. *Chem.*

MASSIVE ROCKS. A. Scacchi. Att. Ist. Nap. i. (5), 8. *Vesuvius;* and N. J. 1888 (2), 136.

MATOPHYRE. W. Sievers. Zts. Ges. Erdk. Berl. xxiii. 30, 37. *Colombia.*

MEIONITE. A. Scacchi. Att. Ist. Nap. i. (5), 44. *Vesuvius;* and N. J. 1888 (2), 136.
J. Vogt. B. H. Ztg. xlvii. 187. *Art.*

MELILITE. L. Darapsky. N. J. 1888 (1), 66. *Chili.*

MELINOMORPHIC ROCKS. B. Lotti. Bull. Soc. Géol. xvi. 406. *Central Italy.*

MELLAVITE. J. Woldrich. Verh. Geol. Reichs. 1888, 164. *Radomilic.*

MELONITE. A. Scacchi. N. J. 1888 (2), 137. *Vesuvius.*
A. Frenzel. Min. Mitth. ix. 400. *Ehrenfriedersdorf.*

MERCURY. A. Scacchi. N. J. 1888 (2), 137. *Vesuvius.*
H. Becquerel. Ann. Chim. Phys. xiv. 227. *Absorption.*
S. Penfield and E. Sperry. Am. J. Sc. xxxvi. 322. *N. Carolina.*
C. Vrba. Zts. K. xv. 203. *Pisek.*

MONTAGNE-NOIRE. J. Bergeron. Bull. Soc. Géol. xvi. 210. *Rocks.*

MONTE AMIATA. Primat. Ann. Min. xiv. 95. *Min. and Rocks.*

V. Novarese. Boll. Com. Geol. xix. 225. *Trachyte.*

L. Ricciardi. Att. Soc It. Mil. xxxi. 195. *Rocks.*

MONTICELLITE. A. Scacchi. N. J. 1888 (2), 137. *Vesuvius.*

MORBIHAN. C. Barrois. C. R. cvi. 428. *Granulite.*

MORLAIX. T. G. Bonney. Q. J. Geol. Soc. xliv. 11. *Rocks.*

MICA. C. Doelter. Bull. Soc. Min. xi. 225. *Art.;* and C. R. 42; and Anz. Ak. Wien. xxv. 196, 150; and Min. M x. 67.

J. Klemencie. Ber. Ak. Wien. xcvi. (2), 807. *Elect.*

A. Knop. N. J. 1888 (1), 69. *Chem.*

F. Sandberger. N. J. 1888 (1), 70. *Silver in.*

F. Sandberger. N. J. 1888 (1), 209. *Chem.*

A. Scacchi. Att. Ac. Nap. i. (5), 8. *Vesuvius:* and Att. Ist. Nap. i. (5), 44.

J. Vogt. Forh. Vid. Sels. Christ. 1887, 6. *Art.;* and B. H. Ztg. xlvii. 197.

MICA-SCHIST. G. Williams. Am. J. Sc. xxxvi. 254. *Peekskill.*

MICROCLINE ROCK. A. Törnebohm. N. J. 1888 (2), 1. *Nullaberg; bitumino*

MICROSOMMITE. A. Scacchi. Att. Ist. Nap. i. (5), 38. *Vesuvius;* and N. J. 1888 (2), 136. *Vesuvius.*

MILIDDENITE. A. Scacchi. Att. Ist. Nap. i. (5), 9. *Vesuvius.*

MILLERITE. A. Scacchi. N. J. 1888 (2), 136. *Vesuvius.*

MINERALS. V. Cornish. Trans. Man. Geol. Soc. xix. 477. *Art.*

T. Hunt. Chem. News, lviii. 180. *Evolution of.*

T. Hunt. Chem. News, lviii. 68, 79, 178. *Classificatio*

J. Joly. Phil. Mag. xxvi. 29. *Spec. grav.*

B. Kosmann. B. H. Ztg. xlvii. 77, 98. *Isomorphism, &*

R. Panebianco. Att. Ist. Tor. vi. 963. *Nomenclature.*

W. Smeeth. Proc. Roy. Dub. Soc. vi. 58. *Specific gravi*

J. Vogt. B. H. Ztg. xlvii. 167. *In slags.*

MINERAL-VEINS. L. Bombicci. Rendic. Ac. Bol. 1888, 62. *Structure.*

H. Geinitz. Isis Ber. 1887, 37. *Origin of.*

MIMETESITE. F. Gonnard. Bull. Soc. Min. xi. 35. *Pontgibaud.*

MINETTE. C. Chelius. N. J. 1888 (2), 74. *Spessart.*

MISPICKEL. P. Eremyev. Verh. Russ. Min. Ges. xxiv. 432. *Altai.*

A. Frenzel. Min. Mitth. ix. 490. *Ehrenfriedersdorf.*

J. Loczka. Zts. K. xv. 40. *Chem.*

A. Schmidt. Zts. K. xiv. 573. *Servia.*

G. Flink. Bih. Vet. Ak. Handl. xiii. 13. *Nordmark.*

MIXITE. W. Hillebrand and H. Washington. Am. J. Sc. xxx *Utah.*

MIZZONITE. A. Scacchi. Att. Ist. Nap. i. (5), 39. *Vesuvius;* and N. J. 1888 (2), 136.

MULL. P. F. Kendall. Geol. Mag. v. 555. *Tachylyte.*

MUSCOVITE. C. Doelter. N. J. 1888 (2), 178. *Art;* and Bull. Soc xi. 227.

...VITE.	M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
...DD MAWR.	A. Harker. Geol. Mag. v. 455. *Riebeckite.*
	A. Harker. Geol. Mag. v. 221. *Rocks.*
...RE.	G. Attwood. Q. J. Geol. Soc. 44, 636. *Rocks.*
...LITE.	G. Cesàro. Bull. Soc. Min. xi. 44. *Cryst.*
...GITE.	W. Hanks. Ber. Ung. vi. 190. *Chem.*
...HA.	A. M. Konshin. Verh. Russ. Min. Ges. xxiv. 23. *Transcaspia.*
...LITE.	L. Meschinelli and A. Balestra. Riv. Min. ii. 13. *Valle del Lavarda.*
...NN.	E. Scacchi. Rendic. Ac. Nap. xxvii. 488. *Vesuvius.*
	A. Scacchi. Att. Ist. Nap. i. (5), 14. *Vesuvius.*
...HRYSOLITE.	A. Scacchi. N. J. 1888 (2), 137. *Vesuvius.*
	E. Scacchi. Zts. K. xv. 293. *Cryst.*
...ANITE.	A. Scacchi. Att. Ist. Nap. i. (5), 47. *Vesuvius;* and N. J. 1888 (2), 137.
...LINE.	A. Scacchi. Att. Ist. Nap. i. (5), 35. *Vesuvius.*
...LINE-BASALT.	J. S. Hyland. Min. Mitth. x. 235. *Kilimanjaro.*
	E. Möller. N J. 1888 (1), 112. *Pietzelstein.*
	J. Stock. Min. Mitth. ix. 429. *Löbauer Berg.*
...LINE-BASANITE.	E. Möller. N. J. 1888 (1), 98, 106. *Linsberg, &c.*
...LINE-SYENITE.	E. Wülfing. N. J. 1888 (2), 16. *Transvaal.*
	J. Machado. Min. Mitth. ix. 324. *Brazil.*
...ALEDONIA.	D. Levat. Ass. Fr. 1887 (2), 534. *Ores of.*
...ERSEY.	N. Britton. School Min. Q. ix. 33. *Rocks of.*
...INERALS.	vid. Arseniopleite, Riebeckite, Cliftonite, Beryllonite, Sulphantimonite, Auerlite, Edisonite, Sulphohalite, Horsfordite, Facellite, Lansfordite, Sperrylite, Hohmannite, Amarantite, Mazapilite, Rhodotilite, Heliophyllite, Barysilite, Pseudonocerite.
	vid. A. Sjögren. Öfv. Vet. Ak. Forh. xlv. 501. *Moss Mine.*
...YORK.	N. Britton. School Min. Q. ix. 33. *Rocks of.*
...EL-ORE.	D. Levat. Ass. Fr. 1887 (2), 534. *New Caledonia.*
...ATINE.	C. Ochsenius. Zts. Geol. Ges. Berl. xl. 153. *Taltal, Min.*
	A. M. Konshin. Verh. Russ. Min. Ges. xxiv. 23. *Transcaspia.*
...OIAN.	J. S. Hyland. Min. Mitth. x. 216. *Kilimanjaro.*
	J. Mülheims. Zts. K. xiv. 223. *Opt.*
...ITE.	L. Darapsky. N. J. 1888 (1), 65. *Chili.*
...OCLASE.	G. Kunz. Am. J. Sc. xxxvi. 223. *N. Carolina.*
	S. Penfield and E. Sperry. Am. J. Sc. xxxvi. 324. *Opt.*
...OCLASITE.	V. Carlo. Rendic. Ac. Bol. 1888, 89. *Monte Cavaloro.*
...ONITE.	W. Hillebrand and H. Washington. Am. J. Sc. xxxv. 298. *Utah.*
...NE.	A. Scacchi. Att. Ist. Nap. i. (5) 19. *Vesuvius.*
...NE-DIABASE.	E. Stecher. Proc. Roy. Soc. Ed. xv. 160. *Contact-phenomena, Scotland.*

Olivine-rock.	F. Sandberger. N. J. 1888 (2), 247. *Coburg.*
Ophite.	P. W. Stuart-Menteath. Bull. Soc. Géol. xvi. 32. *Pyré*
Orpiment.	A. Scacchi. N. J. 1888 (2), 128. *Vesuvius.*
Orthoclase.	P. Eremyev. Verh. Russ. Min. Ges. xxiv. 438. *Blagh Ghora.*
	F. Gonnard. C. R. cvi. 881. *Cryst.;* and Bull. Soc. xi. 177.
	P. Hautefeuille and A. Perrey. C. R. cvii. 1150. *Art.*
	J. Joly. Phil. Mag. xxvi. 33. *Spec. grav.*
	F. Katzer. Min. Mitth. ix. 401. *Bohemia.*
	A. Kenngott. N. J. 1888 (1), 210. *Baveno.*
	A. Lacroix. Bull. Soc. Min. xi. 71. *Matour.*
	A. Scacchi. N. J. 1888 (2), 137. *Vesuvius;* and Att Nap. i. (5), 30.
Ozokerite.	Berlinerblau. Mitth. Nat. Ges. Bern. 1887, xxv. *Chem*
	A. M. Konshin. Verh. Russ. Min. Ges. xxiv. 23. *caspia.*
Palaeopicrite.	K. Lossen. Zts. Geol. Ges. Berl. xl. 372. *Stoppenberg*
Pantelleria.	L. Ricciardi. Att. Soc. It. Mil. xxxi. 195. *Rocks of.*
Pargasite.	M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
	C. Doelter. Min. Mitth. x. 69. *Art. Mica from.*
Parisite.	H. Becquerel. Ann. Chim. Phys. xiv. 193. *Absorption*
	C. Vrba. Zts. K. xv. 210. *Cryst.*
Peekskill.	G. Williams. Am. J. Sc. xxxv. 438. *Rocks of.*
	G. Williams. Am. J. Sc. xxxvi. 254. *Rocks of.*
Pegmatite.	J. S. Hyland. Min. Mitth. x. 212. *Kilimanjaro.*
Pennine.	H. Becquerel. Ann. Chim. Phys. xiv. 189. *Absorption*
	C. Doelter. Min. Mitth. x. 73. *Art. Min. from.*
Periclase.	A. Scacchi. Att. Ist. Nap. i. (5), 5. *Vesuvius;* and N. J. 1888 (2), 137. *Vesuvius.*
Peridote.	A. Scacchi. N. J. 1888 (2), 137. *Ve uvius.*
Peridotite.	F. Hatch. Geol. Mag. v. 257. *Kilimanjaro.*
Perthitophyre.	K. v. Chrustchoff. Min. Mitth. ix. 476. *Volhynia.*
Petalite.	M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
Pharmacolite.	A. DesCloizeaux. Bull. Soc. Min. xi. 192. *Opt.;* and C. R. cvi. 1215. *Opt. Cryst.*
	H. Dufet. Bull. Soc. Min. xi. 187. *Art.*
	E. Jannettaz. Bull. Soc. Min. xi. 212. *Markirch.*
Pharmacosiderite.	H. Hoefer. Min. Mitth. x. 155. *Elba.*
	C. Vrba. Zts. K. xv. 206. *Pisek.*
Phenacite.	P. Hautefeuille and A. Perrey. C. R. cvi. 1800. *Art.*
	G. Kunz. Am. J. Sc. xxxvi. 222. *Maine.*
	S. Penfield and E. Sperry. Am. J. Sc. xxxvi. 320. *Cryst.*
Phillipsite.	A. Scacchi. Att. Ist. Nap. i. (5), 46. *Vesuvius;* and N. J. 1888 (2), 138.
Phlogopite.	C. Doelter. Bull. Soc. Min. xi. 227. *Art.*

HIDPITE. M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
S. Penfield and E. Sperry. Am. J. Sc. xxxvi. 329. *Chem.*
LITE. E. Möller. N. J. 1888 (1), 84. *Linsberg.*
A. Renard. Bull. Ac. Belg. xv. 638. *Cape Verde Is.*
ATES. J. Ladrière. C. R. cvii. 960. *Montay, &c.*
ORITE. H. Pohlig. Ber. Nied. Ges. Bonn. 1888, 48. *S. Carolina.*
P. Franco. Rendic. Ac. Nap. xxvii. 464. *Vesuvius.*
T. G. Bonney. Min. Mag. viii. 108. *Liskeard.*
W. Watts. Brit. Ass. Rep. 1887, 700. *Shropshire.*
ERITE. A. Scacchi. N. J. 1888 (2), 138. *Vesuvius.*
NTITE. G. Flink. Bih. Vet. Ak. Handl. xiii. vii. 52. *Jakobsberg.*
A. Lacroix. Bull. Soc. Min. xi. 148. *Isle de Groix.*
LSTEIN. E. Möller. N. J. 1888 (1), 81. *Rocks of.*
ND. P. Franco. Rendic. Ac. Nap xxvii. 464. *Vesuvius.*
CLASE. A. Scacchi. N. J. 1888 (2), 138. *Vesuvius;* and Att. Ist. Nap. i. (5), 32. *Vesuvius.*
EN. A. Fournier. Bull. Soc. Géol. xvi. 113. *Rocks.*
ITE. E. Dana and S. Penfield. Am. J. Sc. xxxv. 243. *Cryst.;* and Zts. K. xiv. 166.
BAUD. F. Gonnard. C. R. cvi. 75. *Phosphates of.*
GY. J. Früh. Denk. Schw. Ges. xxx. 46. *Switzerland.*
F. Katzer. Jahrb. Geol. Reichs. xxxviii. 355. *Rican.*
RITE. L. de Launay. Bull. Soc. Géol. xvi. 81. *Allier.*
T. Mellard Reade and J. W. Judd. Proc. Liv. Geol. Soc. v. 377. *Manchester.*
A. Michel Lévy. Bull. Soc. Géol. xvi. 227. *Lyon.*
P. de Rouville and A. Delage. C. R. cvii. 665. *Gabian.*
A. Lacroix. C. R. cvi. 1031. *Elæolite-syenite.*
ZITE. J. Lemberg. Zts. Geol. Ges. Berl. xl. 357. *Microsc.*
TE. L. Darapsky. N. J. 1888 (1), 66. *Chili.*
NE. A. Scacchi. N. J. 1888 (2), 138. *Vesuvius.*
TE. H. A. Miers. Min. Mag. viii. 37. *Mon.;* and Zts. K. xv. 129.
H. A. Miers and G. T. Prior. Zts. K. xiv. 113. *Cryst. chem.*
AM. F. Posepny. Min. Mitth. x. 175. *Adinole.*
A. Patera. Verh. Geol. Reichs. 1888, 223. *Rocks of.*
COTUNNITE. A. Scacchi. N. J. 1888 (2), 138. *Vesuvius;* and Att. Ist. Nap. i. (5), 8. *Vesuvius.*
-NOCERITE. A. Scacchi. Att. Ist. Nap. ii. (2). 69. *New Min.?*
ELANE. H. Hoefer. Min. Mitth. x. 156. *Elba.*
INITE. P. Eremyev. Verh. Russ. Min. Ges. xxiv. 446. *Verkh'isetsk.*
YRITE. H. A. Miers. Min. Mag. viii. 37. *Mon.;* and Zts. K. xv. 12[illegible].
E. Rethwisch. N. J. 1888 (2), 251. *Cryst.*
ES. P. W. Stuart-Menteath. Bull. Soc. Géol. xvi. 22. *Rocks.*
S. C. Düsing. Zts. K. xiv. 479. *Cryst.*
G. Flink. Bih. Vet. Ak. Handl. xiii. vii. 17. *Langban, Nordmark.*
F. Gonnard. Bull. Soc. Min. xi. 31. *Pseud. after Calcite.*
H. Hoefer. Min. Mitth. x. 157. *Styria.*

PYRITES. A. Julien. Ann. N. Y. Ac. iv. 125. *Decomposition.*
A. Scacchi. N. J. 1888 (2), 138. *Vesuvius.*
W. Voigt. Nachr. Ges. Gött. 1888, 299. *Elasticity.*
PYROCHROITE. L. Igelström. N. J. 1888 (2), 84. *Grythyttan.*
PYROLUSITE. A. Gorgeu. C. R. cvi. 1101. *Pseud. after Manganite.*
A. Gorgeu. Bull. Soc. Min. xi. 196. *Art.*
PYROMORPHITE. F. Gonnard. Bull. Soc. Min. xi. 31, 32. *Pseud.* *Cerussite and Galena.*
F. Gonnard. Bull. Soc. Min. xi. 35. *Pontgibaud.*
F. Gonnard. C. R. cvi. 75. *Origin of.*
PYROPHYLLITE. A. Kenngott. N. J. 1888 (1), 211. *Visp.*
PYROTECHNITE. A. Scacchi. N. J. 1888 (2), 138. *Vesuvius.*
PYROXENE. A. Scacchi. N. J. 1888 (2), 138. *Vesuvius.*
PYROXENE-SYENITE. G. Klemm. Zts. Geol. Ges. Berl. xl. 184. *Riesa.*
PYRRHOTITE. C. S. Bement. Zts. K. xiv. 257. *Maine.*
B. Kosmann. B. H. Ztg. xlvii. 246. *Fichtelgebirge.*
B. Kosmann. Jahresh. Schles. Ges. 1888, 102. *Kupferb*
A. Scacchi. N. J. 1888 (2), 139. *Vesuvius;* and Att. Nap. i. (5), 9. *Vesuvius.*

QUARTZ. G. Kunz. Am. J. Sc. xxxvi. 222. *Pseud. after Spodume*
E. Artini. Att. Ac. Linc. Mem. v. 4. *Cryst.*
P. Czermak. Ber. Ak. Wien, xcvi. (2), 1217. *Elect.*
H. Foullon. Jahrb. Geol. Reichs. xxxviii. 29. *Bereghs* and Verh. Geol. Reichs. 1888, 95.
C. Friedel. Bull. Soc. Min. xi. 29. *Cryst.*
F. Gonnard. Bull. Soc. Min. xi. 157. *Pontgibaud ;* and C. R. cvi. 558.
F. Gonnard. Bull. Soc. Min. xi. 265. *Puy-de-Dôme ;* C. R. cvii. 667.
W. Hankel. Abh. Sachs. Ges. xiv. 269. *Elect.*
J. Iddings. Am. J. Sc. xxxvi. 208. *In Basalt.*
J. W. Judd. Min. Mag. viii. 1. *Lamellar structure.*
P. Kalugin. Verh. Russ. Min. Ges. xxiv. 253. *Urals,*
A. Leuze. Jahresh. Ver. Württ. 1888, 125, 128. *Min.*
C. A. McMahon. Min. Mag. viii. 10. *Polysynthetic.*
C. Marangoni. Att. Ac. Linc. Rendic. iv. (1), 124. *El* and Riv. Min. ii. 51.
O. Meyer. Proc. Ac. Phil. 1888, 121. *Chem.*
G. A. F. Molengraaf. Zts. K. xiv. 173. *Etching.*
A. Mülheims. Zts. K. xiv. 224. *Opt.*
S. Penfield and E. Sperry. Am. J. Sc. xxxvi. 323. *Tw*
A. Pomel. C. R. cvii. 53. *Algeria.*
A. Pomel. Ass. Fr. xvii. (2), 262. *Souk-Ahras.*
C. Poussin. Bull. Ac. Belg. xv. 368. *Dinant.*
A. Scacchi. Att. Ist. Nap. i. (5), 5. *Vesuvius;* and N. J. 1888 (2), 139.
H. Traube. N. J. 1888 (2), 254. *With basal plane.*

ITZ. E. Warburg and F. Tegetmeier. Pogg. Ann. xxxv. 455. *Elect.*
E. Weinschenk. Zts. K. xiv. 305. *Alt. to Steatite.*

ITZ-DIABASE. C. Schmidt. N. J. 1888 (2), 80. *Taveyannaz.*

ITZ-FELSITE. C. A. Raisin. Geol. Mag. v. 504. *Socotra.*

NITZITE. W. Bayley. Am. J. Sc. xxxv. 388. *Minnesota.*
T. Bonney. Geol. Mag. v. 297. *Ightham.*
A. Fournier. Bull. Soc. Géol. xvi. 113. *Poitevin.*
A. Hettner and G. Linck. Zts. Geol. Ges. Berl. xl. 228. *Andes.*
P. Holland and E. Dickson. Proc. Liv. Geol. Soc. v. 380. *Pontesbury.*
C. A. Raisin. Geol. Mag. v. 417. *Somali Land.*

ITZ-PORPHYRY. H. Foullon. Verh. Geol. Reichs. 1888, 178. *Teplitz.*
A. Hettner and G. Linck. Zts. Geol. Ges. Berl. xl. 229. *Andes.*
G. Kinahan. Proc. Roy. Dub. Soc. vi. 169. *Irish.*
W. Sievers. Zts. Ges. Erdk. Berl. xxiii. 26, 37. *Colombia.*

ITZ-WEDGE. C. A. McMahon. Geol. Mag. v. 548. *Opt.*

NESTEDTITE. G. Linck. N. J. 1888 (1), 213. *Chili* ; and Zts. K. xv. 11.

OLAR. H. Foullon. Jahrb. Geol. Reichs. xxxviii. 19. *Wolfsberg.*
A. Scacchi. N. J. 1888 (2,) 139. *Vesuvius.*

OLITHITE. C. Vrba. Zts. K. xv. 208. *Joachimsthal.*

OL. F. Katzer. Jahrb. Geol. Reichs. xxxviii. 355. *Rocks of.*

ORNITE. G. Flink. Bih. Vet. Ak. Handl. xiii. (7), 82. *Langban.*
M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*

ORTHOSITE. T. G. Bonney. Min. Mag. viii. 103. *Wales.*
A. Harker. Geol. Mag. v. 455. *Mynydd Mawr.*
A. Sauer. Zts. Geol. Ges. Berl. xl. 138. *New Min.*

OSSA DI NIZZA. C. Montemartini. Att. Acc. Tor. xxiii. 482. *Rocks.*

OSOPHANE. H. Becquerel. Ann. Chim. Phys. xiv. 228. *Absorption.*

OS. H. Pohlig. Verh. Nat. Ver. Rheinl. 1888, Korr. Bl. 87. *Rocks.*

OSONITE. M. Bauer. N. J. 1888 (1), 214. *Dillenburg.*
A. Chester. N. J. 1888 (1), 187. *Alteration products.*
H. Foullon. Jahrb. Geol. Reichs. xxxviii. 25. *Rosenau.*

OTILITE. G. Flink. Öfv. Vet. Ak. Förh. xlv. 571. *New Min.*

OS. F. Becke. Min. Mitth. x. 90. *Section-staining.*
F. Löwinson-Lessing. Min. Mitth. ix. 528. *Clastic.*
C. Tomlinson. Phil. Mag. xxvi. 475. *Weathering.*

ORITE. G. Linck. Zts. K. xv. 22. *Copiapo.*

NA NELL'EMILIA. L. Ricciardi. Att. Soc. It. Mil. xxxi. 135. *Rocks of.*

E. Fremy and A. Verneuil. C. R. cvi. 565. *Art.*
A. DesCloizeaux. C. R. cvi. 567. *Cryst.*

LE. A. Cathrein. N. J. 1888 (2), 151. *With Mica and Hæmatite.*
C. Hintze. Zts. K. xiv. 74. *Riemendorf.*
F. Katzer. Min. Mitth. ix. 401. *Bohemia.*
A. Lacroix. Bull. Soc. Min. xi. 73. *Mont Cenis.*
F. Seeland. Verh. Geol. Reichs. 1888, 105. *Hüttenberg.*

ST. DAVID'S. T. Mellard Reade. Proc. Liv. Geol. Soc. v. 359. *Rocks.*

SAL-AMMONIAC. A. Scacchi. Att. Ist. Nap. i. (5), 6. *Vesuvius;* and N. J. 1888 (2), 139.

SALT. H. Foullon. Jahrb. Geol. Reichs. xxxviii. 21. *Truskaw* and Verh. Geol. Reichs. 1888, 94.

F. Geinitz. Arch. Ver. Fr. Meck. 41, 209. *Mecklenburg.*

A. M. Konshin. Verh. Russ. Min. Ges. xxiv. 23. *Tr caspia.*

W. Röntgen and J. Schneider. Pogg. Ann. xxxiv. *Compressibility.*

G. Lucini. Riv. Min. ii. 83. *Opt.*

C. Marangoni. Riv. Min. ii. 50. *Elect.*

A. Mülheims. Zts. K. xiv. 223. *Opt.*

J. Niedźwiedzki. Verh. Geol. Reichs. 1888, 239. *Tru wiec.*

C. Ochsenius. Proc. Ac. Phil. 1888, 181. *Formation.*

A. Scacchi. Att. Ist. Nap. i. (5), 6. *Vesuvius.*

Schardt. Arch. Sc. Phys. Nat. xx. 333. *Bex.*

W. Voigt. Nachr. Ges. Gött. 1888, 323. *Elasticity.*

E. Wilson. Q. J. Geol. Soc. xliv. 761. *Durham.*

SANDSTONE. H. Weld. Am. Chem. J. x. 224. *Lockport, chem.*

SANIDINE. A. Mülheims. Zts. K. xiv. 234. *Opt.*

SANIDINITE. A. Osann. N. J. 1888 (1), 117. *Sao Miguel.*

SANTA MARTA. W. Sievers. Zts. Ges. Erdk. Berl. xxiii. 1. *Rocks of.*

SAPPHIRE. C. Friedel. Bull. Soc. Min. xi. 64. *Australia.*

P. Kalugin. Verh. Russ. Min. Ges. xxiv. 253. *Urals, loc*

SARCOLITE. A. Scacchi. Att. Ist. Nap. i. (5), 39. *Vesuvius;* and N. J. 1888 (2), 139.

SASSOLITE. A. Scacchi. N. J. 1888 (2), 139. *Vesuvius.*

SAUSSURITE-GABBRO. P. Michael. N. J. 1888 (1), 32. *Fichtelgebirge.*

SAVITE. E. Artini. Att. Ac. Linc. Rendic. iv. (1), 51. = *Natrolite.*

A. Cossa. Att. Ac. Linc. Rendic. iv. (1), 99.

SAXONY. E. Danzig. Mitth. Min. Inst. Kiel, i. 33. *Rocks of.*

SCACCHITE. A. Scacchi. N. J. 1888 (2), 139. *Vesuvius.*

SCAPOLITE. C. Doelter. C. R. cvii. 42. *Art.*

SCHEELITE. A. Baltzer. Mitth. Nat. Ges. Bern. 1887, 166. *Rothlaue* and N. J. 1888 (2), 85.

H. Becquerel. Ann. Chim. Phys. xiv. 191. *Absorption.*

A. Frenzel. Min. Mitth. ix. 400. *Ehrenfriedersdorf.*

Gurlt. Ber. Nied. Ges. Bonn. 1888, 23. *New Zealand.*

A. Kenngott. N. J. 1888 (1), 179. *Rothlaue.*

SCHISTS. A. Fournier. Bull. Soc. Géol. xvi. 113. *Poitevin.*

A. Hettner and G. Linck. Zts. Geol. Ges. Berl. 216, *Andes.*

W. Sievers. Zts. Ges. Erdk. Berl. xxiii. 12. *Colombia.*

SCOLECITE. L. Darapsky. N. J. 1888 (i.), 66. *Chili.*

G. Flink. Bih. Vet. Ak. Handl. xiii. (8). *Cryst.*

A. Scacchi. Att. Ist. Nap. i. (5), 47. *Vesuvius;* and N. J. 1888 (2), 139.

...RODITE.	H. Hoefer. Min. Mitth. x. 155. *Elba.*
...AITE.	E. Mallard. Bull. Soc. Min. xi. 302. *Opt.*
	A. Sella. Riv. Min. iii. 12. *Mon.*
...IOPAL.	H. Geinitz. Isis Ber. 1887, 37. *Scheibenberg.*
	C. Montemartini. Att. Acc. Tor. xxiii. 491. *Riviera di Nizza.*
...ARMONTITE.	A. Schuller. Ber. Ung. vi. 101. *Chem.*
...PENTINE.	C. Montemartini. Att. Ac. Linc. Rendic. iv. (1), 369. *Valle del Nure.*
	A. Scacchi. N. J. 1888 (2), 140. *Vesuvius.*
	A. Somervail. Geol. Mag. v. 553. *Lizard.*
...ENGEBIRGE.	H. Pohlig. Ber. Nied. Ges. Bonn. 1888, 20, 51, 60. *Rocks.*
	H. Pohlig. Verh. Nat. Ver. Rheinl. 1888, 89. *Rocks.*
...EPAZOTE.	A. Scacchi. N. J. 1888 (2), 131. *Vesuvius.*
...SIA.	E. Dathe. N. J. 1888 (2), 166. *Minerals of.*
...CATES.	F. Clarke. Am. Chem. J. x. 120. *Chem. structure of.*
	E. Schneider. Am. Chem. J. x. 405. *Chem.*
...IFIED WOOD.	Bleicher. C. R. cvii. 572. *Algeria, &c.*
...LMANITE.	A. Lacroix. Bull. Soc. Min. xi. 150. *With Andalusite.*
	M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
...ER.	P. Eremyev. Verh. Russ. Min. Ges. xxiv. 432. *Altai.*
	W. Topley. Brit. Ass. Rep. 1887, 510. *Distribution.*
...ITERUDITE.	G. v. Rath. Zts. K. xiv. 257. *Cryst.*
...S.	J. Curie and G. B. M. Flamand. Ass. Fr. xvii. (1), 182. *Min. of.*
...LITE.	A. Scacchi. Att. Ist. Nap. i. (5), 39. *Vesuvius;* and N. J. 1888 (2), 140.
...A-MICROCLINE.	J. S. Hyland. Miñ. Mitth. x. 249. *Kilimanjaro.*
...OTRA.	C. A. Raisin. Geol. Mag. v. 504. *Rocks.*
...ALI LAND.	C. A. Raisin. Geol. Mag. v. 414. *Rocks.*
...MITE.	A. Scacchi. N. J. 1888 (2), 140. *Vesuvius.*
...PSTONE.	H. Brady. Q. J. Geol. Soc. xliv. 1. *Fiji.*
...ENE.	C. S. Bement. Zts. K. xiv. 257. *Canada.*
	G. Flink. Bih. Vet. Ak. Handl. xiii. (7), 85. *Nordmark.*
	A. Scacchi. N. J. 1888 (2), 141. *Vesuvius*; and Att. Ist. Nap. i. (5), 45. *Vesuvius.*
...RRYLITE.	S. L. Penfield. Zts. K. xv. 290. *Cryst.*
	H. L. Wells. Zts. K. xv. 285. *New Min.*
...IERULITES.	F. Wallerant. Bull. Soc. Géol. xvi. 927. *Formation.*
...SSART.	C. Chelius. N. J. 1888 (2), 67. *Rocks of.*
...NEL.	A. Scacchi. Att. Ist. Nap. i. (5), 14. *Vesuvius;* and N. J. 1888 (2), 140.
...DUMENE.	P. Jannasch. N. J. 1888 (1), 196. *Chem.*
	G. Kunz. Am. J. Sc. xxxvi. 222. *Quartz, pseud. after.*
...UROLITE.	M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
	de Limur. Bull. Soc. Min. xi. 61. *Morbihan.*
...ATITE.	E. Weinschenk. Zts. K. xiv. 305. *Alt. from Quartz.*
...BNITE.	P. Drude. Pogg. Ann. xxxiv. 489. *Opt.*

Stilbite.	E. Artini. Att. Ac. Linc. Rendic. iv. (1), 536. *Montec Maggiore.*
Strontianite.	J. Beckenkamp. Zts. K. xiv. 67. *Kaiserstuhl.*
Stypticite.	G. Lenck. N. J. 1888 (1), 213. *Chili;* and Zts. K. xv. 1
Sudbury.	T. G. Bonney. Q. J. Geol. Soc. xliv. 32. *Rocks of.*
	J. Collins. Q. J. Geol. Soc. xliv. 834. *Copper ores.*
Sulphantimonite (lead).	L. Eakins. Am. J. Sc. xxxvi. 450. *Colorado.*
Sulphur.	H. Foullon. Jahrb. Geol. Reichs. xxxviii. 20. *Truskawie*
	A. M. Konshin. Verh. Russ. Min. Ges. xxiv. 23. *Tr caspia.*
	J. Niedzwiedzki. Verh. Geol. Reichs. 1888, 239. *Trus wiec.*
	R. MacIvor. Chem. News, lvii. 64. *N. S. Wales.*
	G. A. F. Molengraaf. Zts. K. xiv. 43. *Cryst.*
	Preussner. Zts. Geol. Ges. Berl. xl. 194. *Louisiana.*
	A. Scacchi. Att. Ist. Nap. i. (5), 3. *Vesuvius.*
Sulphohalite.	W. E. Hidden and J. B. Mackintosh. Zts. K. xv. 294. *Min.;* and Am. J. Sc. xxxvi. 463.
Sussexite.	S. Penfield and E. Sperry. Am. J. Sc. xxxvi. 323. *Chem.*
Switzerland.	J. Früh. Denk. Schw. Ges. xxx. *Rocks of.*
Syenite.	W. Sievers. Zts. Ges. Erdk. Berl. xxiii. 10. *Colombia.*
Sylvanite.	W. Hanks. Ber. Ung. vi. 190. *Chem.*
Sylvite.	W. Röntgen and J. Schneider. Pogg. Ann. xxxiv. 5 *Compressibility.*
	W. Voigt. Nachr. Ges. Gött. 1888, 323. *Elasticity.*
Symplesite.	C. Vrba. Zts. K. xv. 206. *Pisek.*
Tachylyte.	G. Cole. Q. J. Geol. Soc. xliv. 300. *Locality.*
	P. F. Kendall. Geol. Mag. v. 555. *Mull.*
Talc.	P. Walker. Am. Chem. J. x. 45. *Chem. N. Carolina.*
Tantalite.	C. Vrba. Zts. K. xv. 201. *Pisek.*
Taveyannaz.	C. Schmidt. N. J. 1888 (2), 80. "*Sandstone.*"
Tenorite.	A. Scacchi. Att. Ist. Nap. i. (5), 4. *Vesuvius;* and N. J. 1888 (2), 141.
Tephrite.	J. S. Hyland. Min. Mitth. x. 247. *Kilimanjaro.*
	E. Möller. N. J. 1888 (1), 84. *Linsberg.*
Tephroite.	G. Flink. Bih. Vet. Ak. Handl. xiii. (7), 64. *Pajsberg.*
Tetrahedrite.	A. Cathrein. Min. Mitth. x. 56. *Cryst.*
Thaumasite.	M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*
Thermonatrite.	A. Scacchi. Att. Ist. Nap. i. (5), 14. *Vesuvius.*
Thinolite.	G. Lebour. Brit. Ass. Rep. 1887, 700. = *Jarrowite.*
Thomsonite.	A. Scacchi. N. J. 1888 (2), 130. *Vesuvius.*
Thorite.	J. Sebelien. Tidsk. Phys. Chem. ix. 97. *Chem.*
Tiger's-eye.	H. Hoffmann. Isis Ber. 1887, 11.
Topaz.	P. Eremyev. Verh. Russ. Min. Ges. xxiv. 463. *Cryst.*
	P. Kalugin. Verh. Russ. Min. Ges. xxiv. 253. *Urals, loc.*
	A. Mülheims. Zts. K. xiv. 225. *Opt.*
	W. Voigt. Pogg. Ann. xxxiv. 981. *Elasticity.*

RMALINE. J. Joly. Phil. Mag. xxvi. 33. *Spec. grav.*
P. Kalugin. Verh. Russ. Min. Ges. xxiv. 253. *Urals, loc.*
F. Katzer. Min. Mitth. ix. 401. *Bohemia.*
W. Ramsay. Bih. Vet. Ak. Handl. xiii. (6). *Cryst.*
R. Riggs. Am. J. Sc. xxxv. 35. *Chem.*
E. A. Wülfing. Min. Mitth. x. 161. *Chem.*

HYTE. L. Bucca. Boll. Com. Geol. xix. 57. *Viterbo.*
C. Klein. Mitth. Ak. Berl. 1888, 15. *Bolsener See;* and N. J. Beil. Bd. vi. 3.
V. Novarese. Boll. Com. Geol. xix. 225. *Mte. Amiata.*
H. Pohlig. Verh. Nat. Ver. Rheinl. 1888, Korr. Bl. 87. *Rhine.*

HYTIC-LAVAS. A. Verri. Bull. Soc. Geol. vii. 76. *Central Italy.*

SCASPIA. A. Konshin. Verh. Russ. Min. Ges. xxiv. 23. *Min. of.*

TOLITE. C. Doelter. Min. Mitth. x. 70. *Art. Min. from.*

EFFKINITE. R. Price. Am. Chem. J. x. 38. *Chem. Virginia.*

A. Scacchi. Att. Ac. Nap. ii. (2). *Campania.*

S. G. Rolland. Bull. Soc. Géol. xvi. 187. *Rocks.*

ITE. G. Rousseau and J. Bernheim. C. R. cvi. 1530. *Art.*

ANY. C. de Stefani. Boll. Com. Geol. xix. 221. *Rocks of.*

A. Pichler. Verh. Geol. Reichs. 1888, 298. *Min.*

LITE. W. Hillebrand and H. Washington. Am. J. Sc. xxxv. 300. *Utah.*

NSTEIN. E. Möller. N. J. 1888 (1), 81. *Rocks of.*

ED STATES. A. Foote. Nature, xxxvii. 68. *Gems.*

NTINITE. A. Schuller. Ber. Ung. vi. 101. *Chem.*

DLITE. J. Früh. Denk. Schw. Ges. xxx. 51. *Switzerland.*
K. de Kroustchoff. Bull. Soc. Min. xi. 173. *Foni.*

CITE. P. Walker. Am. Chem. J. x. 41. *Chem. Virginia.*

INE. A. Scacchi. Att. Ist. Nap. i. (5), 11. *Vesuvius;* and N. J. 1888 (2), 141.

VIUS. H. Johnston-Lavis. Geol. Mag. v. 445. *Form of.*
A. Scacchi. N. J. 1888 (2), 123. *Minerals of;* and Att. Ist. Nap. i. v. *Rocks and Min. of;* and Att. Ac. Nap. i. v. *Lava.*

NIA CITY. G. vom Rath. Ber. Nied. Ges. Bonn. 1888, 14. *Rocks.*

RBO. L. Bucca. Boll. Com. Geol. xix. 57. *Volcanic rocks of.*

YNIA. K. v. Chrustchoff. Min. Mitth. ix. 470. *Labradorites of.*

NERITE. M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*

SERITE. M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*

BURG. G. Greim. N. J. 1888 (1), 1. *Diabase, &c.*

LERITE. J. Sebelien. Tidsk. Phys. Chem. ix. 97. *Chem.*
M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*

TRAM. A. Frenzel. Min. Mitth. ix. 400. *Ehrenfriedersdorf.*

LASTONITE. A. Scacchi. N. J. 1888 (2), 141. *Vesuvius;* and Att. Ist. Nap. i. (5), 18.

WOLLASTONITE.	C. Doelter. Min. Mitth. x. 82. *Art. Min. from.* M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.* Platz. Verh. Nat. Ver. Karls. x. 4. *Gengenbach.*
WURTZITE.	W. Stahl. B. H. Ztg. xlvii. 207. *Art.* A. Verneuil. C. R. cvi. 1104, cvii. 101. *Opt.*; and Bull. Soc. Chim. xlix. 757. *Phosphorescence.*
XENOTIME.	H. Becquerel. Ann. Chim. Phys. xiv. 194. *Absorption.* W. Hidden. Am. J. Sc. xxxvi. 380. *N. America.* C. Vrba. Zts. K. xv. 205. *Pisek.*
ZEOLITES.	Riv. Min. ii. 94. *Montecchio Maggiore.* E. Scacchi. Rendic. Ac. Nap. xxvii. 492. *Vesuvius.*
ZINCOSITE.	A. de Schulten. C. R. cvii. 405. *Art.*
ZINNWALDITE.	C. Doelter. N. J. 1888 (2), 179. *Art.*
ZIRCON.	H. Becquerel. Ann. Chim. Phys. xiv. 196. *Absorption.* P. Hautefeuille and A. Perrey. C. R. cvii. 1000. *Art.* F. Pisani. Bull. Soc. Min. xi. 300. *Binnen.* A. Scacchi. Att. Ist. Nap. i. (5), 45. *Vesuvius*; and N. J. 1888 (2), 141.
ZOISITE.	M. Lévy and A. Lacroix. C. R. cvi. 777. *Opt.*

CONTENTS OF No. 45.

PAGE

Minerals from the Apatite-bearing Veins at Noerestad, near Risör, on the S.E. Coast of Norway. By R. H. Solly, M.A., F.G.S. (With a note on their occurrence by A. L. Collins) 1

On the Pinite of Breage in Cornwall. By J. H. Collins, F.G.S. 8

Danalite from Cornwall. By H. A. Miers, M.A., and G. T. Prior, M.A. 10

Mineralogical Notes from Torreon, State of Chihuahua, Mexico. By Henry F. Collins, Assoc.M.Inst.C.E., A.R.S.M. 15

Note on Crystals of Manganite from Harzgerode. By Frank Rutley, F.G.S. 20

Analysis of Aragonite from Shetland. By J. Stuart Thomson 22

Orpiment. By H. A. Miers, M.A. 24

Reviews 26

Abstracts 29

Index to Mineralogical and Petrographical Papers, 1888. By H. A. Miers, M.A., and G. T. Prior, M.A. 52

ORIGINALLY PRINTED IN GREAT BRITAIN BY MESSRS. WILLIAMS AND STRAHAM, LONDON. REPRINTED OFFSET LITHO BY BIDDLES LTD., THE CITY PRESS, GUILDFORD, SURREY